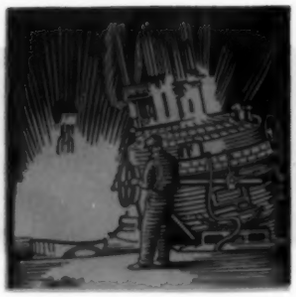


The Foundry

for August

Discrimination In Pricing Castings

IN ITS closing hours, the Congress on June 19 passed the Robinson-Patman antidiscrimination act leveled directly at chain store buying. This law, if enforced, will affect all business, large and small, manufacturer, distributor and user alike. It will affect foundries.

The law forbids price discriminations that limit, destroy or prohibit competition. It governs one who sells, one who buys and the customer of the buyer. Price differentials between buyers can be extended only because of difference in cost of manufacture, sale or delivery resulting from differing methods or quantities of the product.

It does not permit lower prices merely because quantities purchased are larger. There must be a proved difference in cost, a lower price cannot be claimed for a large order when a decrease in cost is due to a lowering of overhead on the sellers entire business. Small quantity purchases must be permitted to share such saving.

A seller is permitted to lower his price to meet a competitors price, but the burden of proof is on the seller. Rumor or the statement of the purchaser do not suffice.

The law provides three means of enforcement, namely: Through complaint to the trade commission; by civil suit brought by the competitor claiming injury with the possible assessment of damages tripling the amount involved; by criminal prosecution by the department of justice. The criminal clause provides fine and imprisonment for being a party to a sale or contract which discriminates against competitors of purchasers. Either inducing or receiving discriminations is unlawful. Also it is unlawful to sell goods in one part of the United States at a lower price than elsewhere to eliminate a competitor; or to grant unreasonably low prices for the same reason.

What will this law mean in foundry selling practices? Can the unit price per pound for varying types of castings be sustained or will piece price practice be imperative? What of quantity discounts in present schedules? Will the differentials given on quantity contracts be sustained?

Can a small manufacturer buying a dozen cast parts claim the same price per pound as his larger competitor using thousands of parts similar in general character, analysis of metal and destined for a similar service?

Will the effect hasten stabilized prices, defend foundries under pressure from big buyers?

Can captive foundries selling part of their production in the jobbing trade justify distribution of overhead? Will the law stimulate customers to build foundries? Will jobbing shops be able to prove lower costs, grant lower prices? Or will prices tend upward?

Will the law further localize trade areas?

Will price reporting by associations and trade papers insure against complaints under the law?

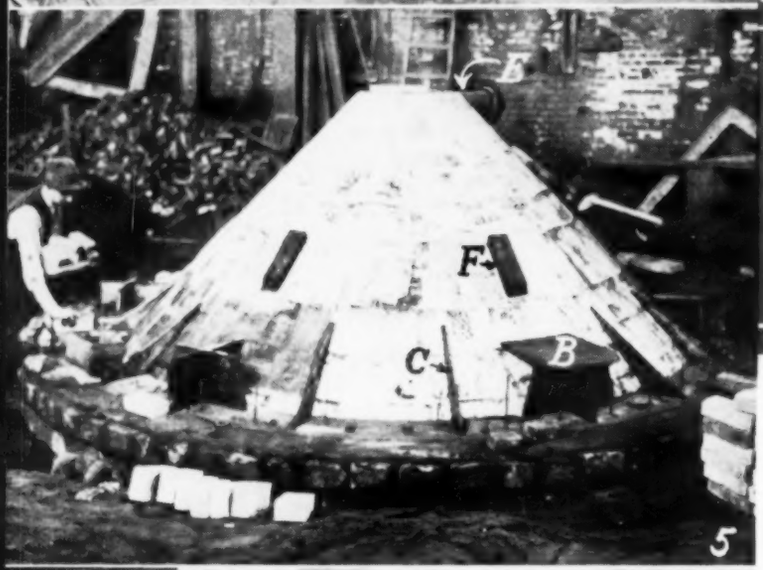
Foundrymen are not lawyers. Lawyers don't know all the answers. Neither do the editors of THE FOUNDRY. Nor does Congress, or such a sweeping measure would have had more study.

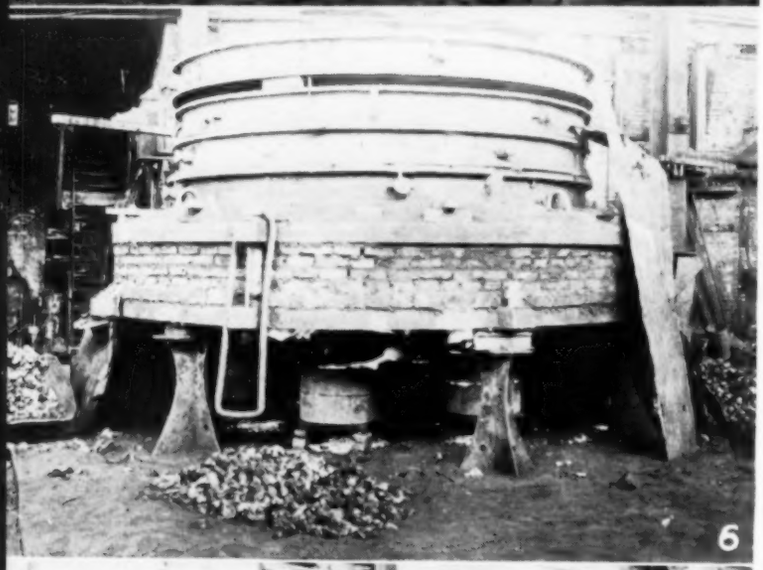
BUT—foundries should study the law, scan present sales practices and prices, establish sound costs and apply them.

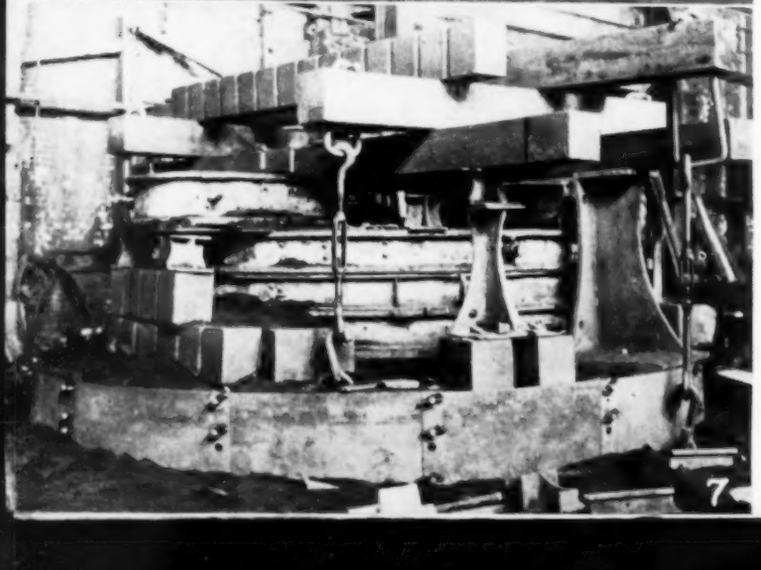
Scarce and Valuable

COMMENTS on the jobbing vs. captive foundry outlook which appear on page 25 of this issue have raised many related questions. One foundryman in conversation with an editor holds that many good operating men with more ambition than business ability become managers, partners or owners of jobbing foundries. Lack of capital, equipment, management, sales and business ability, lead to failure. Meantime, excess capacity, inferior service and general disturbance to existing foundry-customer relations ensue. "With good superintendents as scarce as they are today, salaries should yield such men a better future in the operating end than as managers and owners," says this foundryman. Is he right?

Editor







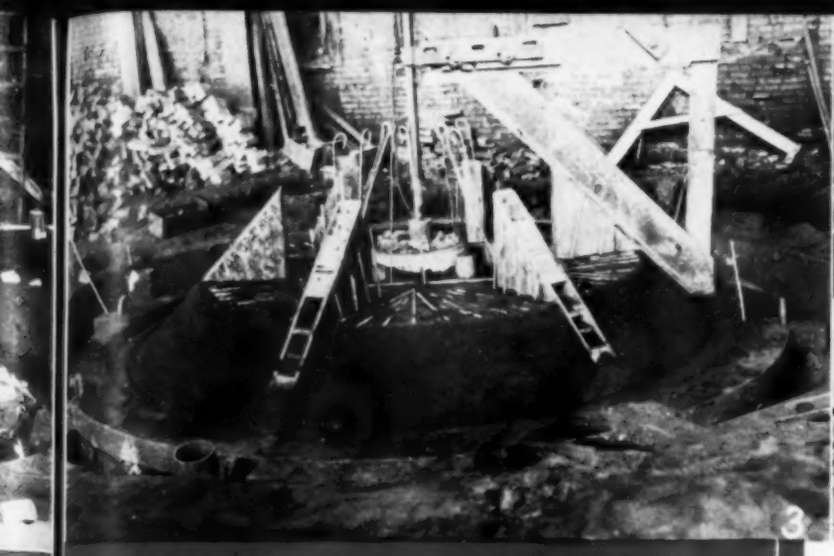
LARGE POT CASTING SWEPT UP IN

THROUGH the adoption of molding machines and other mechanical equipment the technique involved in the production of small and medium size castings has been revolutionized in recent years. The change has not been so pronounced in the manufacture of large castings, although the practice of introducing sections made up of dry sand cores has simplified greatly many of the formerly hazardous features considered safe only in the hands of highly skilled men with a background of long and intensive training.

Loam molding is the only branch of foundry practice which has not changed with the years. For certain classes of castings a loam mold presents advantages that cannot be duplicated by any other method. Outside the fact that a loam mold practically guarantees a perfect casting, clean, solid and true to shape and size, one of the principal advantages of the method is that patternmaking cost is reduced to a material extent. This is particularly true on circular castings where a simple sweep attached to a spindle serves to form the inside and outside walls of the mold. In some instances part of the mold is made in sand and the remainder in loam.

A mold of this kind, one of several made recently at the plant of the Kilby Mfg. Co., Cleveland, is shown in the accompanying illustrations. The castings formed part of a plant for processing tar and are known as saturator bottoms. Top and

Fig. 1—The cleaned casting. Fig. 2—The core nailed and blackwashed. Fig. 3—Core was reinforced with vertical and transverse rods. Fig. 4—Applying a thickness of facing sand to the core. Fig. 5—Outside of mold built on lifting ring. Fig. 6—Cope dried over coke fires. Fig. 7—Mold in condition to receive the molten metal



IS MADE IN MOLD LOAM

By PAT DWYER

sectional views of the castings are shown in Fig. 8. The complete casting, in the opposite position to which it was cast, and cleaned for shipment to the machine shop is shown in Fig. 1. The casting is 13 feet diameter, 5 feet 2 inches high, 1¼-inch thick and weighs 14,650 pounds.

Over a period of approximately 60 years the Kilby Mfg. Co. has specialized in the production of large castings, particularly castings for the sugar and chemical industries. Hence pits, flasks, lifting and covering rings and other pieces of equipment in wide variety are available. Obviously this is an important factor in deciding which method to adopt in molding any given casting. In the present instance two lifting rings and several flask rings approximately the proper size were selected for use. The only new equipment included the sweep, patterns for the six interior triangular, narrow chambers *A*, as shown in Fig. 8, the six brackets of feet *B*, on the outside, the twelve auxiliary outside brackets *C*, the six prints *D* for narrow slot cores, and the nozzle *E*. Coreboxes included one for the chamber *A*, one for the slot *D*, one for the nozzle *E* and another for making a set of dry sand cores to form the gutter or trough under the rim of the pot.

One of the large circular pits was cleaned out and a heavy foundation plate was bedded down level. A long spindle held by suitable guy rods at the top was centered and plumbed in the spindle seat on the plate. Four 6-inch vent pipes were erected at four equidistant points to facilitate escape of gas and steam from the cone shaped body of sand forming the inside of the mold. Necessity of providing ready exit for the gas and steam was increased by the presence of the six large hollow brackets which penetrated so deeply into this core. A coke bed on the bottom plate was built up in the center at each successive ramming until it extended almost to the top of the cone.

A single course of bricks was laid on the bottom plate extending to the outside edge. A second course was laid on the first to form a smaller circle and then a coating of loam was swept over the surface to form a slightly tapered step joint for the lifting plate. This feature may be noted in Fig. 2. The lifting ring then was lowered into place and sand was rammed in the center to the approximate height of the bottom of the interior brackets. At this stage a horizontal wood strip attached to the main sweep was employed to form a seat for the brackets.

Interior Part Built First

That the reader unfamiliar with this branch of molding may follow the description readily, it may be pertinent to point out that the cone shaped interior part of the mold was built first. A layer of sand corresponding to the thickness of metal was rammed over the cone. The outside part of the mold was built partly in loam and partly in sand against this sand thickness. The outside of the mold was removed. The thickness of sand was removed from the cone. The mold then was reassembled and filled with metal. Apparently simple and elemental, but in reality involving careful planning, comprehensive foundry experience and a high degree of manual skill and dexterity on the part of the molder.

While sweeping the cone, or inside part of the mold a wood strip 1¼ inches thick was fastened to the edge of the sweep. Later, this strip was removed while the sweep was employed in forming the sand surface conforming to the outside surface of the anticipated large pot casting.

The bracket patterns were set up on the prepared level bed and adjusted accurately in place by radial lines on the bed and by the sweep which coincided with the slanting face in passing. Sand was rammed around them in the usual way and continued in successive

layers until the cone was built to the desired height. Reinforcing rods were placed vertically around the bracket patterns and in the center of the cone. Horizontal rods were laid on each successive course of sand. This feature is illustrated in Fig. 3.

The cone of black sand roughly swept to the desired shape was reduced in size by removing approximately a 1-inch layer of sand from the entire surface. The deficiency was made up by facing sand pressed into place by a brick in the hand of the molder as shown in Fig. 4. The upper part or cap, as shown in the same illustration, was built first, swept, slicked and finished while the molder was free to stand or lean on the rough sand beneath. The remainder of the cone then was covered with facing sand, swept to the desired shape, finished with the tools and nailed. A thickness of sand corresponding to the thickness of the casting wall then was packed on the surface and swept to shape and covered with sheets of paper to form a parting as shown in Fig. 5.

In the next stage with the aid of the sweep, plumb bob and a pair of trammels the molder placed the various loose pieces of pattern in their proper positions as shown in the same illustration. These included the nozzle *E*, as in Fig. 5, six feet or supports *B*, twelve brackets *C*, and six top core prints *F* for the cores in the interior of the brackets. A course of brick and loam was laid on the lifting plate on the outside of the rim of the sand pattern and the inside of the rim was filled with a continuous row of dry sand cores. Strands of wire attached to these cores projected upward and later were anchored in the brick work above. A layer of loam was laid against the paper and around the loose pattern parts and the brick work was built up as high as the top of the feet *B*. The loose flange on top of each foot pattern was removed and the cavity covered by a flat core. Another course of bricks was covered by a heavy flat iron ring, which in turn was bolted to the lifting ring beneath. In this manner this part of the mold became a solid, substantial unit capable of supporting the remainder of the dome and the superstructure.

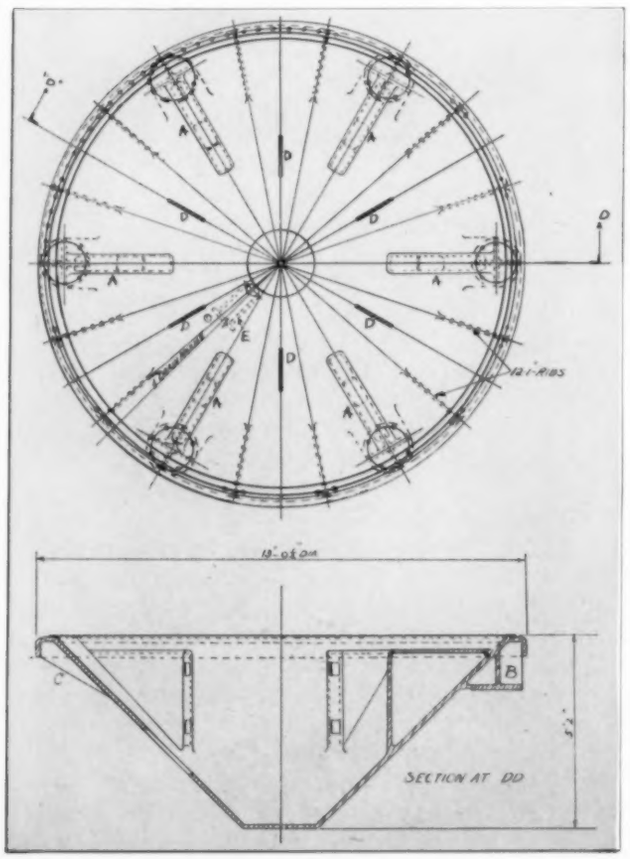


Fig. 8—Plan and sectional view of casting showing location of interior and exterior members

Vertical Gates Deliver Metal

Sand rammed in three sections of circular iron flasks formed the remainder of the outside part of the mold up to the flat top. A flat parting was made here with the exception of the area around the nozzle *E* where the parting line dipped to conform to the joint along the nozzle center. A plain, circular cope rammed on top of the mold completed the assembly.

As the building of the mold progressed, suitable provision was made for entrance of the molten metal later at two opposite sides from two ladles. Five vertical gates ¾ x 3 inches and spaced horizontally 3 inches apart delivered metal into the mold in an area about 10 inches above the bottom rim. Three similar gates admitted metal at a point about 2 feet from the top. The pouring basin for each set of gates was made up in such a manner that the deep basin near the lip of the ladle delivered metal only to the sprues leading to the lower gates. When in the judgment of the operator the metal in the mold had risen approximately half the height, the stream from the ladle was increased, so that the metal flowed into the elevated part of the basin and from there into the sprues feeding the upper part of the casting. A rough sketch of the pouring basin is shown in Fig. 9.

In separating the mold, the flat cope was removed first, turned over on its back and the comparatively small area covering the top and nozzle was finished and blacked. The second section including the three flask rings, the two lifting rings and the loam wall between them was lifted away. The span was too great for one set of chains suspended from one crane, while the bridges of two cranes separated the hoisting blocks too far to secure a perpendicular pull on each. This apparent difficulty was overcome by placing two long binder bars across the top. Two shorter binders were placed on top of these at right angles. With slings and turnbuckles the upper binders were attached to the lower ring. Two cranes were attached to the lower binders and (*Please turn to page* 66)

Why More Captive Foundries?

SPECIALTY shops, large firms operating foundry departments for their own exclusive service and those which also solicit jobbing business, and the regular type of general jobbing interest all are represented in comment on the editorial which appeared in THE FOUNDRY for July, under the foregoing heading. While each in a measure reflects an individual analysis of the problem, many are characterized by a breadth of outlook and all of those chosen as typical for presentation, add constructive thought. All are given the courtesy of anonymity.

What is the future of the jobbing foundry? Is the trend toward integration in manufacturing? Is the captive foundry ultimately to be a department in the plant of every large consumer of castings?

The viewpoint of various leaders in the industry is reflected in the comments which follow:

Owns Captive Shop and Also Sells Castings in Jobbing Trade

AS USUAL I am very much interested in your editorial for July, and in this particularly interesting subject because of our operation of a captive foundry. Of course, in our case with the foundry dating back many years, we might say that our reason for having a captive foundry is the fact that the largest profits were made in the foundry in the early days, and again in our case we were pioneers in the manufacture of a gray iron product which even today cannot be purchased from jobbing foundries.

If we exclude the past and think only in terms of the present, I can see no sensible reason for a manufacturing concern to build a new foundry today when castings can be bought at such extremely low prices in all parts of the country. Regarding expansion of existing foundries, the justification depends upon the purpose of the expansion and in some cases a small increase in capacity will enable the manufacturer to absorb a much larger proportion of his overhead expense.

This is the picture on the face of it. What if we go deeper in the analysis? Perhaps a partial answer may be found in the experience which we had during 1920. At that time it was impossible for our own foundry to turn out enough castings for our needs, and we bought castings all the way from Portland, Maine to Wilmington, Delaware. The results were very unsatisfactory, due to the lack of the close contact which exists between our own departments. It was necessary for us to assign one patternmaker to a full-time job of visiting all of the supplying foundries to try to keep them straight with regard to our requirements. The machine shop suffered a great deal from the mistakes which were made. That was in the day of high prices, so that there was not much excuse for the difficulties encountered. Loose pieces were left off patterns, core prints were misplaced, and there were all sorts of mistakes which were extremely costly to the machine shop.

The situation became so bad that it was decided that the company should build a large foundry in conjunction with its western plant. We had the foundry completely laid out on paper when the depression of 1921 led to the cancellation of the whole project, and since then we have been glad that it did.

I do not know what morals you can draw from this experience. It was not chiseling prices which gave us unsatisfactory castings in that case, but rather the lack of close proximity between foundry and machine shop.

Aside from making its own castings, our foundry sells jobbing castings on the outside. We manufacture a high cost, quality casting, and refuse to sell it except at a profit. We have innumerable cases of customers and potential customers who frequently tell us that our castings are better than those which they are buying, but still they do not feel that they can pay us higher prices than they are paying for the inferior product.

Trade Associations Should Teach

So in many cases the solution is in the hands of the buyer, and I feel that one of the most valuable functions of foundry trade associations and organizations interested in foundry welfare is the education of the buyer through advertising, literature, and other means. Frequently the practical man in the shop realizes the final economy of the better product, but the buyer is primarily interested in the superficial figure represented by first cost.

One of the best things the old Gray Iron in-

(Please turn to page 72)

Defects Caused by Improper Gates

Nozzle effect should be avoided carefully when pouring certain nonferrous alloys

By N. K. B. PATCH

IN PLAYING a hose on my lawn and varying the force of the spray so as to protect the tender shoots or newly seeded ground, I was struck with the similarity between the control of this flow of water and the control of the flow of metal into mold.

One of the great mistakes commonly found in the gating of castings is the provision of a gate which causes a squirting or nozzle effect to take place. This jet is similar to the spray of water from the nozzle of the hose. If the foundryman could see this result during the time the metal is poured into the mold, he would realize the harmful effect of the practice.

It is not uncommon to see a series of gates cut from a runner, each constricted as to cause a spraying of the metal as it passes through the gate into the mold. It is rather by good luck than good management that good castings result in any sufficient quantity to satisfy the producer when the gates are so constructed.

THE FOUNDRY frequently has emphasized the necessity for proper gating and proper risers on castings. Pat Dwyer has written some excellent articles on the subject and had many illustrations in the articles that should impress readers with the details described. I do not think, however, that the development of gates which produce a nozzle effect, has been sufficiently stressed. Take for example, the tapering gate, known as the horn gate. These usually are supplied with an ample amount of metal at the source so that at the small end where they are attached to the casting a jet is produced. This jet frequently tears the surface of the mold and causes dirty castings by reason of the inclusion of sand. It also mixes air with the metal and causes scum and slag inclusions. It agitates the metal in the mold as the mold fills, and causes further damage.

The ideal gating in every case is that which allows the metal to enter the mold as quietly as possible and yet fills it with sufficient rapidity to avoid cold shots. Choke gates are common practice and have in some instances been successful because they have reduced the jet effect in the mold. However, the reduction of the nozzle effect was not recognized as the benefit derived by reason of the choke gate.

Think again of the action of the hose with the conventional nozzle. By setting it in one position an open flow of water is secured, which, after it leaves the nozzle breaks into myriads of drops because it passes through a small orifice at a relatively high velocity. Remove the nozzle, and the water passes out of the hose at a lower velocity but the same amount of water is passed per unit of time since the orifice is larger and it passes out very quietly without any agitation. The pressure of the water entering the hose is the same in both instances.

Nozzle Effect Causes Trouble

Apply this to the gating of a mold. The entrance of the mold is the sprue and by keeping the sprue full, uniform pressure is maintained. By providing the proper size of gates and taking the necessary precautions to see that there is no tendency to nozzle effect, it is no trouble at all to insure the same quiet flow of metal into the mold that occurs in the flow of the water when the nozzle is removed from the hose.

Agitation caused by a constricted orifice or nozzle is not so serious in pouring red brass or some of the leaded bronzes and, therefore, has not been recognized as one of the common difficulties in the foundry. In pouring yellow brass, aluminum bronze, manganese bronze, and the like, it becomes a most serious cause of trouble and may not be recognized as the source, since there are many other contributing factors that may be blamed for the defects. The foundryman easily can find out whether the gating is causing this trouble or not by locating a riser opening in the cope so that he can watch the flow of the metal into the mold during the pouring process.

The foundryman should see that the sprue size is standardized and that every mold is poured so that the sprue is kept full, thus insuring standard pressure in (*Please turn to page* 66)

CUPOLA PRODUCES HUGE TONNAGE

WHAT is claimed to be a record day's run was attained recently at the plant of the American Cast Iron Pipe Co., Birmingham, Ala., when one of the large cupolas melted 354.169 tons of iron. Elapsed time between putting on and shutting off the blast was 10 hours and 20 minutes, from 5 a. m., to 3:20 p. m., an average hourly melting rate of 34.3 tons. The cupola responsible for this remarkable performance differs to some extent from the ordinary type in that it is oval instead of circular in cross section.

The present cupola measures 72 inches on the short diameter and 102 inches on the long diameter inside the lining at the tuyeres. The lining of high grade refractory tile is straight for about 5 feet above the tuyeres. From the upper part to an area about a foot below the charging door sill the lining is made up of cast iron pipes for preheating the blast. The accompanying data in tabular form cover practically every detail of construction and operation for three heats. In two later heats improvement in individual features appear, but the total tonnage shown for the first heat still constitutes a record. The

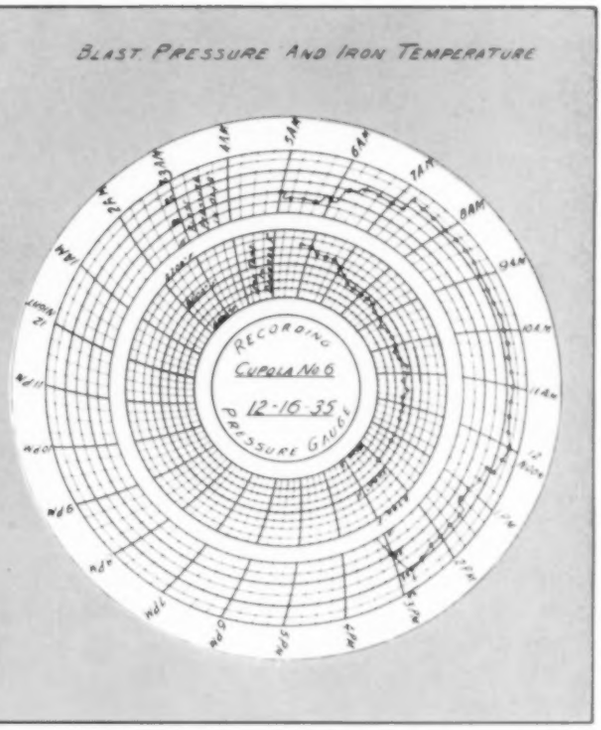


Fig. 1—Showing blast pressure and iron temperature on typical day's operation

blast pressure ranged between 18 and 27 ounces, average 24.6 ounces; bed coke 5500 pounds; iron charges 11,180 pounds; coke charges 990 pounds; iron to coke ratio, including bed coke 10.4 to 1, and excluding bed coke 11.3 to 1.

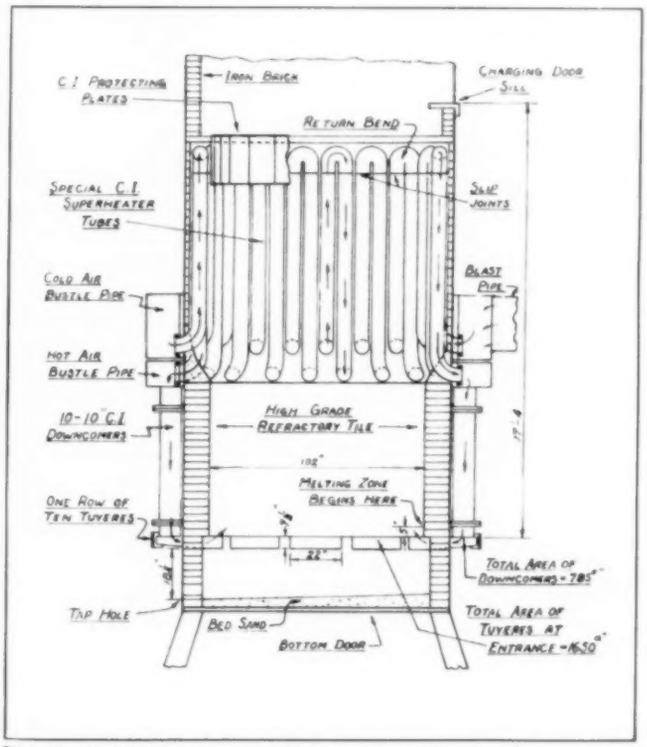


Fig. 2—Sectional view of hot blast cupola showing relative position of the various units

Details of Cupola Operations For Three Heats

	Old Style Dec. 16, 1935	Old Style Jan. 24, 1936	New Style Mar. 12, 1936
Weight of iron charges, lbs.	11,180	11,392	11,345
Weight of coke charges, lbs.	990	1,000	1,047
Weight of limestone charges, lbs.	340	320	320
Wind on	5:00 a.m.	10:15 a.m.	6:20 a.m.
Cupola tapped	5:30 a.m.	10:45 a.m.	6:41 a.m.
First ladle out of 9-ton forehearth	5:44 a.m.	10:57 a.m.	6:57 a.m.
Blast pressure—Maximum, ounces	27.0	29.5	28.0
Minimum, ounces	18.0	21.0	21.5
Average, ounces	24.6	28.8	26.0
Blast temperature—			
Maximum, degrees Fahr.	290	280	360
Minimum, degrees Fahr.	220	200	280
Average, degrees Fahr.	265	250	330
Iron temperature at cupola spout for entire heat—Max., deg. Fahr.	2710	2640	2637
Minimum, degrees Fahr.	2615	2572	2587
Average, degrees Fahr.	2640	2605	2596
Total iron charge, lbs.	715,520	604,192	624,000
Melting coke used, lbs.	63,360	53,000	57,600
Bed coke used, lbs.	5,500	5,500	5,500
Total coke used, lbs.	68,860	58,500	63,100
Total limestone used, lbs.	21,760	16,640	17,600
Coke used per ton of iron, including the bed, lbs.	192.4	194.0	202.2
Iron to coke ratio, including bed coke	10.4 to 1	10.3 to 1	9.9 to 1
Coke used per ton of iron, excluding the bed, lbs.	177.0	175.4	185.2
Iron to coke ratio, excluding bed coke	11.3 to 1	11.4 to 1	10.8 to 1
Total tons from cupola spout	354.2	299.8	308.9
Wind off	3:20 p.m.	6:40 p.m.	2:40 p.m.
Total hours blowing	10.33	8.42	8.33
Average hourly melting rate for entire heat (tons)	34.3	35.6	37.1
Last ladle out of forehearth	3:25 p.m.	6:50 p.m.	2:40 p.m.
Number of brick required to repair the cupola after this heat (9-inch equivalents)	510	422	457

Attractive trade paper advertisements of nonferrous, gray iron, steel and malleable castings

ADVERTISING AND THE JOBBING FOUNDRY

By WILLIAM BALSAM

OF THE 3700 jobbing foundries in the United States and Canada, the number that advertise to their local markets probably does not exceed 200. As advertising is merely salesmanship in print, the founder's avoidance of such salesmanship explains in part the unsold condition of his market. A buyer is sold when he has been persuaded to purchase a product at a price that yields a profit to the seller.

Usually in an industry where printed selling is limited, personal selling has achieved a satisfactory condition. This is not so in the castings industry. Sit next to a purchasing agent on a busy day. Six or seven foundrymen will call. What they say boils down to this: "I hear you are using such and such castings. We can quote you a price on them that will 'knock your ears off.' "

If this purchasing agent were to confide in us, he might reveal that cheap castings are causing him enough trouble already—that they are keeping him in constant hot water with his production department. He might confide that his bargain foundry stands him up on delivery and that to keep production going, his men are forced to machine rejected castings entailing extra operations which nullify first cost savings.

This is not an article on personal selling, yet it must be apparent that the soundest advertising will not help a founder whose salesmen are more worried about their competitor's price than they are about the customer's requirements. Nor will advertising assist the castings seller who believes that the possession of a captivating per-

sonality is the solution to the sales problem.

The fallacy of that belief is revealed when we consider that the purchasing agent's many personal contacts have made him a master of human relations. He is schooled in the art of turning the personal element in a business transaction to his firm's advantage. That he has employed this legitimate talent to hammer down prices, is an old story.

The function of foundry salesmanship is not to make a sale. It is to sell at a profit. That is where advertising enters.

The chief obstacles to foundry advertising are certain deep seated opinions held by many foundrymen. What are these opinions? Let us examine them in turn.

1. The Market For Castings Is Too Limited To Advertise

Because of the small local nature of the casting market, the cost of reaching that market is much less than the cost of reaching a consumer market. As the advertising cost is smaller, the profit from advertising should be greater.

Here is a comparative example: A soap maker has a $200,000 yearly production. To maintain this production and sales he may have to reach from 1 to 5 million people at a cost of perhaps $35,000. Whereas a founder who wishes the same dollar volume of sales can concentrate his campaign in several appropriate business papers at a net cost perhaps under $2000. He can mail a well directed campaign to as little as 200 localized prospects for a total yearly cost as low as $400.

Assuming that both advertisers have achieved their goal, the founder has reached it for about 6 per cent of the soap maker's cost. The comparison is not exaggerated.

2. We Cover Our Market By Salesmen. We Don't Have To Advertise.

Your salesmen and the salesmen from the bargain foundry call on the same people. The latter claim as much or more for their castings as your men do. There is a difference. You know what that difference is. The buyer does not. Your advertising can change that.

It is interesting to note that few salesmen present a coherent picture of their firm's complete set up. Time doesn't permit. Your advertising can bridge that gap. The sound reasons why your castings are worth the extra price can be marshaled before the buyer. After your advertisements have shown him the basic difference between you and your back yard competitor, you are going to enjoy his business—because responsible firms like to do business with other responsible firms. Sweat shop buying has never been an enduring part of the American scheme.

3. If Advertising Did Bring Us Inquiries, We Couldn't Meet Our Competitor's Price.

Cadillac doesn't solicit Chevrolet business. The tone of their advertising takes care of that. There are certain reasons why your present buyers pay you higher prices for castings. These reasons should be exploited in your advertising. Then your story will be directed to those who are looking for the same kind of castings you are in a position to produce. Advertising properly written is as selective as a Park Avenue club.

4. Nobody Reads Advertising. I Throw Mine In The Waste Basket.

If you spend $25 to reach 100 castings buyers and 95 throw your ad away, the 5 remaining readers may result in one contract worth many times your investment. You make advertising profits on the people you sell, not the 99 you miss.

5. We Find That Our Satisfied Customers Are Our Best Advertising.

Satisfied customers are too busy these days to go around boasting about your castings. Your advertising man can interview these customers, quote some of their satisfied claims in your advertising and if you can substantiate these claims, your advertising will bring infinitely more business than that of the founder who does not have satisfied customers.

6. How Can We Measure Whether Or Not Our Advertising Is Productive?

If your advertising has convinced only ten buyers in your district that low cost production is the main thing—and that cheap castings are not conducive to that end—your advertising has paid handsomely. If you have convinced buyers that there are two founders in their lives—their present source of supply and yours—your advertising has pulled. Because some day a change will occur and you will have the inside track.

Sound foundry advertising will pull better than other advertising because the market is starved for it.

It is true that you cannot send out 200 mailing pieces or run a half page trade journal advertisement and obtain a dozen accounts by return mail. But are such easy accounts desirable? The worth while buyers have connections with their present sources. Good connections that have mellowed through the years. You do not employ fly-by-night methods to land such accounts in person. Why think in such hectic terms in reference to advertising. You are in business to stay, so are the limited number of prospects in your territory and the cost of reaching them is little enough.

As the advertising months pass, you will find that a few of those buyers who always turned you down, suddenly have discovered that your castings are worth the extra price. You will do business with buyers whom you thought had family and (*Please turn to page* 66)

FOUNDING OF PRESSURE CASTINGS

By H. H. JUDSON
Goulds Pumps Inc., Seneca Falls, N. Y.

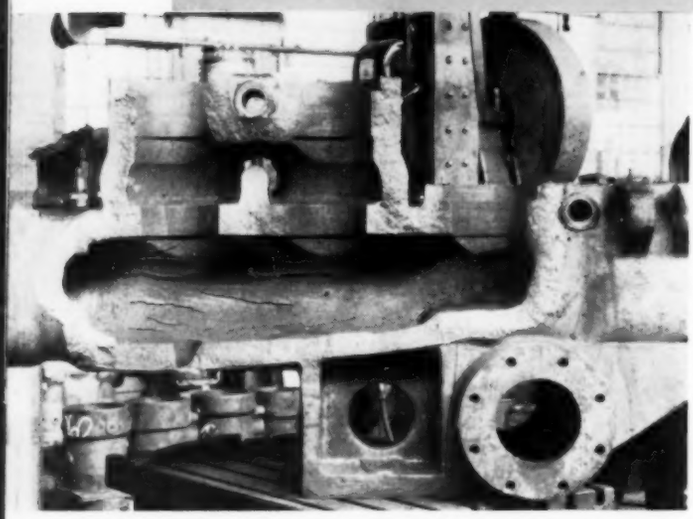


Fig. 1—Line pump cylinder weighing 2300 pounds, tested to destruction at 6000 pounds per square inch pressure

This is the first of two articles from the annual exchange paper of the A. F. A. presented at the recent Glasgow conference of the Institute of British Foundrymen.

GENERALLY speaking, engineering gray iron castings can be divided into two broad classifications, namely, structural castings and pressure castings. The structural casting field covers those parts of apparatus which serve as frames, foundations or beds. Examples of that class are motor and generator frames, pump and engine frames, bedplates, gear and transmission casings. The field of pressure castings includes those, which in operation, are subjected to internal pressures such as hydraulic pump cylinders and casings, pipes, valve boxes and pressure fittings.

Structural castings are designed from a mass and rigidity standpoint. Provision of sufficient iron to satisfy the mass or inertia requirements automatically meets rigidity and strength requirements. Iron used in that type of casting need not be of such an analysis that, throughout any one casting, a close-grained homogeneous metallic structure exists.

An open-grained structure in the center of chunky sections is not detrimental. There are exceptions to this thought, noticeably machine tool beds and frames, but by and large, structural castings do not depend upon freedom from internal-draws, spongy spots, coarse graphitic carbon, and upon a dense fine-grained structure for their efficiency and utilitarian aspect.

On the other hand, pressure castings are quite dependent upon absence of draws, shrinks, spongy spots, coarse graphitic carbon and demand a dense, fine-grained homogeneous structure to be serviceable. Structure of the iron, as for instance, the amount of graphitic carbon present and, more vital still, the condition in which this graphite exists is all important in castings subjected to pressure.

Two distinct types of iron mixtures are used in the author's foundry. The first type, in the high test iron class, is that in which various percentages of steel rails form the major part of the charge, the remainder being pig iron and spiegeleisen. The second type contains no steel of any kind, the charges being made up entirely of pig iron and scrap.

Returns from the steel mix, or high test irons are used in the pig iron-scrap mixtures for bedplates and frame parts. The first type of iron is used in all castings which are subjected to pressures above 500 pounds per square inch. It also is used in large size low pressure pumps. Operating pressures of these pumps may be low but the over-all load on large unsup-

Fig. 2—Two-cupola iron at 100 diameters, etched

ported sections may be such that a strong iron is required.

Pressure tightness is of primary importance while ease of machining is secondary. The pig-scrap mixture is used for parts in the small hand and power pumps in which the operating pressures do not exceed 200 pounds per square inch. Machinability is of equal importance with pressure tightness in this class of work. Castings for pumps which operate at pressures between 200 and 500 pounds per square inch may or may not require a high test iron.

The small sizes in this range are amply strong because of low over-all loads and metal sections are light enough so that the cooling rate is sufficiently rapid to insure good snug iron. Larger sizes in this range usually require a high test iron. Machinability is not likely to be so important, in this class, as pressure tightness can be a problem.

That part of our line which requires iron mixtures in which steel rails are used will be described first. All of our thoughts concerning the founding of pressure castings, in which steel rails form a part of the cupola charges, date back to 1926 to the inception of the two-cupola process for making high test iron pressure castings in our foundry. A brief description of this process, our experiences with it, and the thoughts behind it follow:

Two cupolas, one with a 54-inch bore and the other with a 72-inch bore, are used to produce a high test iron. The 54-inch cupola is used to melt charges of the following composition: 1400 pounds steel rails, 4 inches or larger; 135 pounds pig iron, 15 per cent silicon, and 85 pounds spiegeleisen, 20 per cent manganese. Tuyeres in this cupola are set 6 to 7 inches above the sand bottom. The bed height when charging is begun, is 34 inches above the top of the single row of tuyeres.

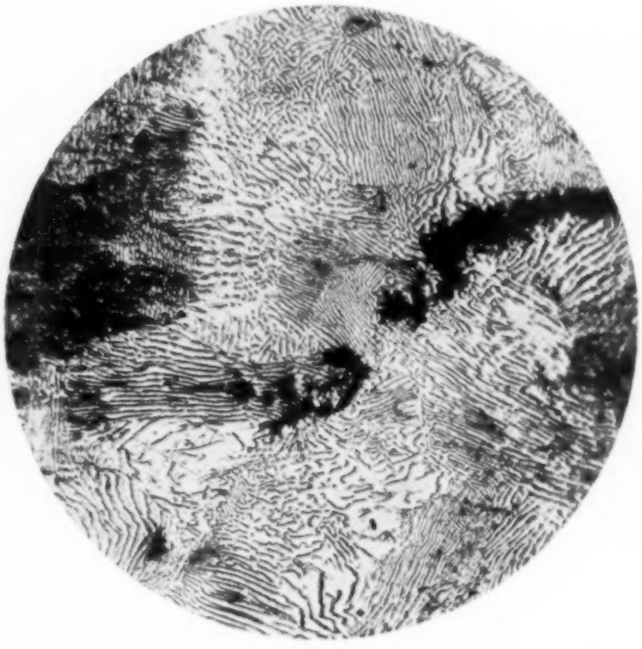


Fig. 3—Two-cupola iron at 500 diameters, etched

The cupola stands fully charged for 1½ hours before the blast is put on. Coke splits are 180 pounds each and the blast volume is kept at about 5500 cubic feet per minute with 12 to 16 ounces blast pressure. The tap is run continuously. The spout is of the skimming type. All of this iron is tapped into one ladle and will average about the following analysis: Silicon, 1.35 per cent; sulphur, 0.11 per cent; manganese, 1.00 per cent; phosphorus, 0.13 per cent and total carbon, 2.40 per cent.

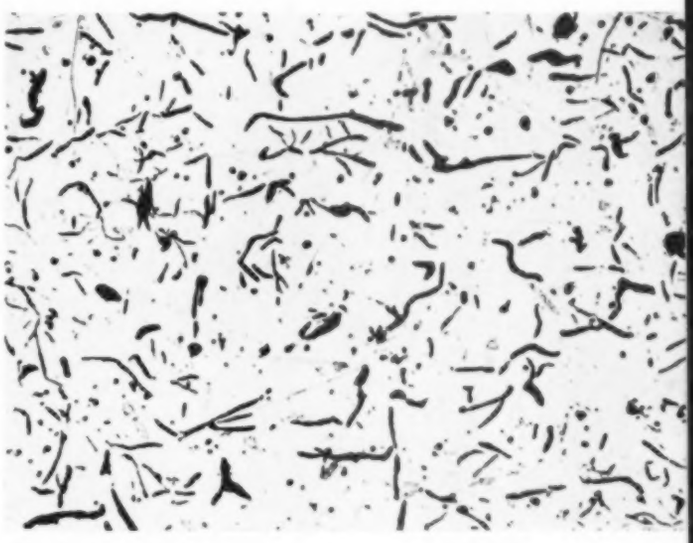


Fig. 4—Cylinder iron poured hot, 50 diameters, unetched

Meanwhile, the 72-inch cupola is melting a soft iron of the following analysis, for regular production work, the burden consisting of pig and scrap iron: Silicon, 2.40 per cent; sulphur, 0.10 per cent; manganese, 0.55 per cent; phosphorus, 0.35 per cent, and total carbon, 3.25 per cent. A predetermined amount of this soft mixture is run into a crane ladle, suspended from a crane scale, and then is dumped into the ladle containing the hard iron from the 54-inch cupola.

The resulting analysis of this mixture on the basis of 4 tons of hard iron to 1 ton of soft iron runs about as follows: Silicon, 1.50 to 1.70 per cent; sulphur, 0.11 to 0.13 per cent; manganese, 0.90 to 1.10 per cent; phosphorus, 0.15 per cent, and total carbon, 2.50 to 2.65 per cent. This iron is used for castings that operate at pressures up to 1500 pounds per square inch on oil and gasoline, and which are tested up to 3500 pounds per square inch.

These castings weigh from 500 pounds up to 3000 pounds. Wall thickness of the cylinders, valve boxes and piping details, average from 2 to 2½ inches in thickness, with valve deck sections as thick as 3 and 4 inches. Like other irons of this type it shows a markedly uniform structure across a (*Please turn to page* 69)

GRAY CAST IRON

By JOHN W. BOLTON

Chapter XI

General Physical Constants

FOR a pure metal, melting and freezing points are the same, provided heating and cooling rates are slow enough to avoid hysteresis lag. For a complex material like cast iron, the question is somewhat more complicated. Solid cast iron is composed of a number of components, from steadite, largely iron-iron phosphide eutectic, which melts in the range 1750 to 1800 degrees Fahr., to graphite which does not melt directly no matter how high the temperature is.

Table XIV

Melting Points of Cast Iron

Combined Carbon per cent	Graphite per cent	Silicon per cent	Manganese per cent	Phosphorus per cent	Sulphur per cent	Melting Point Deg. Fahr.
			PIG IRONS			
3.98	.....	0.14	0.10	0.220	0.037	2030
3.74	0.14	0.38	0.16	0.172	0.032	2040
3.52	0.54	0.47	0.20	0.200	0.036	2100
3.22	0.68	0.71	0.09	0.142	0.038	2055
2.28	1.14	0.42	0.13	0.185	0.026	2110
1.96	1.90	0.75	0.63	0.097	0.028	2170
1.72	2.17	1.88	0.54	0.446	0.028	2190
1.48	2.30	1.41	1.39	0.168	0.033	2210
1.24	2.68	0.65	0.26	0.201	0.020	2230
0.87	3.10	1.34	0.42	0.158	0.030	2230
0.80	3.22	1.30	0.59	0.172	0.042	2230
0.38	3.43	2.44	0.57	0.422	0.048	2250
0.24	3.48	2.54	0.30	0.060	0.020	2260
0.13	3.43	2.40	0.90	0.082	0.032	2280
			CAST IRONS			
4.20	0.20	0.63	0.33	0.254	0.040	1990
3.90	0.16	0.75	0.66	0.240	0.030	2000
3.40	.....	0.42	0.07	0.196	0.029	2040
1.63	2.27	1.46	0.50	0.092	0.032	2170
1.22	2.66	1.69	0.47	0.274	0.037	2240
0.17	3.57	2.09	0.43	0.272	0.042	2260

Structural changes which must occur when solid gray iron melts to liquid cast iron take time, making the determination of melting points, or more properly, melting ranges, quite difficult. In 1898 Moldenke ran a number of tests of practical significance. Although the absolute temperatures may be questioned, the tests were conducted in such manner that the irons were heated at about the same rates.

The results shown in Table XIV are decidedly interesting. It will be noted that the higher the combined carbon, or the lower the graphite content, the lower the relative melting ranges. Using similar methods, it was found that steel is melted at about 2450 degrees Fahr. Moldenke noted that with the same combined carbon, a cast iron melted at 2260 degrees Fahr. This is due to the solution of graphite, hence increase in combined carbon content before complete melting of the cast iron.

Moldenke's experiments indicate that white iron melts more readily than gray iron, and gray iron in turn melts more rapidly than steel. This knowledge is of value to those conducting melting operations. Some of the results of Saeger and Ash—*Transactions,* American Foundrymen's Association, 1932, pages 172 to 187,—as rearranged by the author are shown in Table XV. It will be noted that the arrangement is in ascending order of the sum percentage total carbon plus 0.3 times percentage silicon.

The liquidus temperature, point of first freezing of solid metal, varies inversely as the sum (carbon plus 0.3 silicon) bearing out the well known fact that the liquidus temperature increases as the iron becomes more hypoeutectic—or conversely, the eutectic composition is of lowest melting point. Note that the liquidus temperature is rather independent of the combined carbon content of *final* gray iron. Although their own thermal data seems to indicate 1958 degrees Fahr. as an apparent solidus, a point of eutectic solidification, Saeger and Ash chose 2102 degrees Fahr. as the true solidus for the purpose of their investigation. This is the figure given by Hatfield—*Cast Iron in Light of Recent Research,* 1928, page 2.

Note then that the freezing range in some cast irons is

Table XV

Melting and Freezing Points

No.	Symbol	Total carbon	Silicon	Graphite	Combined carbon	Manganese	Phosphorus	Sulphur	C plus 0.3 Si	Liquidus
1	VIII	3.69	2.87	3.53	0.16	0.59	0.68	0.03	4.55	2102
2	VII	3.67	2.10	3.26	0.41	0.54	0.46	0.05	4.30	2102
3	IX	3.39	2.86	3.20	0.19	0.58	0.67	0.03	4.25	2102
4	XIII	3.27	2.87	2.88	0.39	0.52	0.59	0.03	4.13	2111
5	XIV	2.90	2.88	2.68	0.22	0.44	0.66	0.03	3.76	2183
6	IV	3.10	1.69	2.31	0.79	0.48	0.35	0.04	3.60	2282
7	III	3.08	1.68	2.18	0.90	0.44	0.35	0.04	3.58	2282
8	VI	2.18	1.24	0.56	0.62	0.35	0.27	0.04	2.56	2462
9	X	2.08	0.84	0.00	2.08	0.24	0.15	0.06	2.33	2516
10	XII	1.87	1.50	0.01	1.87	0.27	0.14	0.06	2.32	2489
11	XI	1.98	0.85	0.00	1.98	0.25	0.14	0.06	2.23	2516

Based on data of Saeger and Ash—*Transactions,* American Foundrymen's association, 1932.

negligible as in Nos. 1, 2, 3, 4 of Table XV, while in markedly hypoeutectic irons as Nos. 8, 9, 10 and 11, it may extend over 350 degrees Fahr. or even 400 degrees Fahr. In the Impact Report—*Proceedings,* American Society for Testing Materials, 1933—Roeser and Spencer, measured the practical freezing point for various commercial irons cast into blocks 4 x 4 x 8 inches. That point on the cooling curve was that at which the pyrometer readings of the solidifying irons were constant over four successive readings at 15 minute intervals. Their results are shown in Table XVI. In this table increase in the sum carbon plus 0.3 silicon and in phosphorus percentage seems to lower the freezing point although it is evident there are other factors.

Specific heat of a material is the amount or quantity of heat required to raise a unit mass of the material one degree. It is expressed as calories per gram per degree Cent. in the metric system, and as Btu. (British thermal units) per pound per degree

Table XVI

Freezing Points of Some Irons

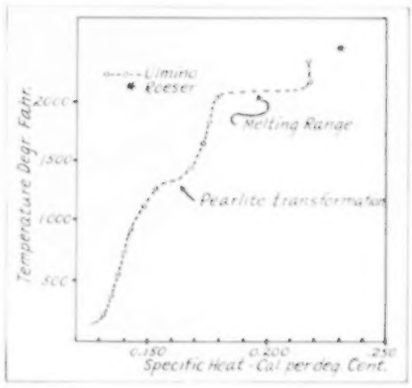
Freezing Point, Deg. Fahr.	Cent.	Carbon per cent	Silicon per cent	Phosphorus per cent	Nickel per cent	Chromium per cent	Copper per cent
2021	1105	3.25	2.08	1.99	.....	.....	.....
2071	1133	3.61	2.06	0.75	.....	.....	.....
2079	1137	3.53	1.67	0.68	.....	.....	.....
2082	1139	3.41	2.44	0.63	.....	.....	.....
2084	1140	3.49	1.68	0.74	.....	.....	.....
2088	1142	3.07	1.97	0.40	.....	.....	.....
2093	1145	3.08	2.07	0.04	16.29	1.89	6.12
2107	1152	3.49	2.08	0.19	1.17	0.65	0.32
2116	1158	3.95	1.90	0.07	.....	.....	0.32
2125	1163	3.79	1.47	0.12	.....	.....	0.21
2127	1164	3.52	2.94	0.04	.....	.....	0.34
2127	1164	3.46	2.35	0.15	0.65	.....	.....
2138*	1170	2.79	2.44	0.03	0.50	0.09	.....
2142	1172	3.38	1.18	0.14	.....	.....	.....
2142	1172	2.88	1.99	0.43	.....	.....	.....
2142	1172	3.43	2.35	0.20	.....	.....	.....
2143†	1173	3.14	2.69	0.18	0.25	0.09	.....
2145	1174	3.12	2.18	0.63	.....	.....	.....
2147	1175	3.39	2.50	0.43	.....	.....	.....
2151	1177	3.25	1.63	0.42	.....	.....	.....
2156	1180	3.49	0.53	0.33	.....	.....	.....
2158‡	1181	3.05	2.70	0.16	0.60	0.24	.....
2217	1214	2.61	2.38	0.06	1.08	0.09	.....
2224	1218	2.50	2.20	0.04	.....	0.08	.....
2233	1223	2.53	3.25	0.02	10.59	1.55	4.07

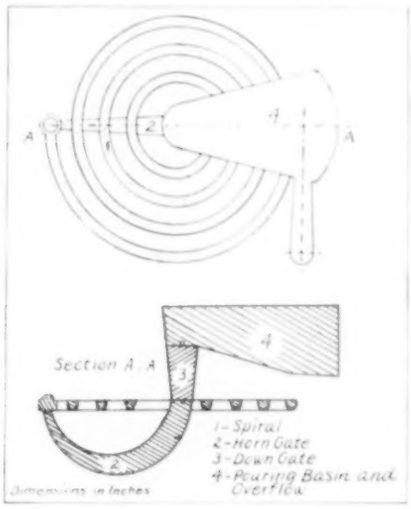
*Treated with calcium silicide.
†—0.07 per cent molybdenum.
‡—0.45 per cent molybdenum.

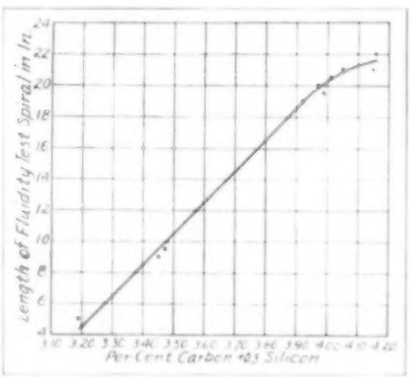
Fahr. in English units. Expressed in another way it is the ratio of the thermal capacity of the material to that of water at 15 degrees Cent.

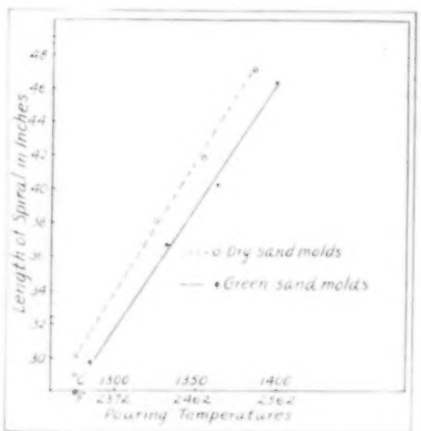
In general increase in percentages of carbon, silicon, sulphur and phosphorus increases the specific heat. The specific heat increases with increase in temperature. The data of Ulmino and the calculated value of Roeser are shown in chart form in Fig. 119. The metal used by Ulmino contained 4.22 per cent carbon, 1.48 per cent silicon, 0.12 per cent phosphorus, 0.73 per cent manganese and 0.03 per cent sulphur. Note in Fig. 119, the abrupt changes in specific heat as the metal passes through the pearlitic transformation and through the melting range. Ulmino gives the heat of fusion as 47 calories per gram.

From a practical viewpoint the term fluidity of gray iron is used to indicate the relative ability of the metal to fill a mold when poured therein. In other words the term as used by (*Please turn to page* 60)

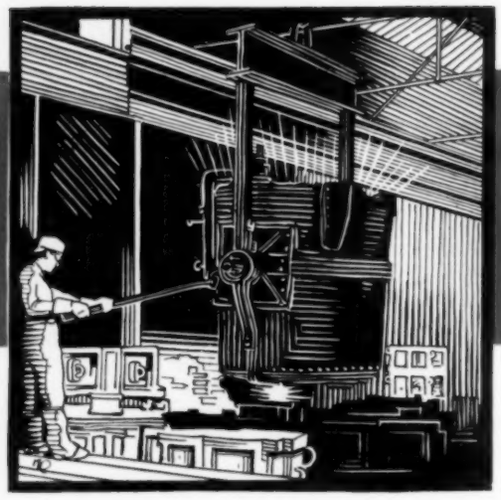








From top to bottom—Fig. 119—Specific heat increases with increase in temperature. Fig. 120—Spiral test strip measures fluidity or running qualities of the metal. Fig. 121—Showing the practical effect of percentage of carbon plus 0.3 per cent of silicon on fluidity. Fig. 122—Fluidity spirals indicate that metal cast in dry sand molds runs farther than in green sand molds



Questions and Answers

This department includes problems relating to metallurgical, melting and molding practice encountered in making castings. Questions from subscribers addressed to the Editor of The Foundry will be answered by members of the editorial staff, supplemented where occasion requires by the advisory staff.

Abrasion Resistance May Have Entirely Different Meaning

We are working on an inquiry calling in part for some ribbed cast iron trench plates 30 x 50 inches and 1 inch thick which weigh 350 pounds. The inquiry asks for an alternate bid for making the plates in an abrasion resisting cast iron. This we assume to be similar to that used in making door saddles and steps. Can you tell us what material is used for that purpose, and the method of applying this material in the mold?

Presumably the trench plates that you refer to are similar to those designated as floor plates. While it is possible that the abrasion resisting cast iron called for in the alternate bid, means those coated with abrasive grain, it is our opinion that it refers to the type of iron, rather than just the surface.

Obtaining an abrasive face on a casting, according to our understanding, is a proprietary process which involves sprinkling the abrasive grain which may be either silicon carbide or aluminum oxide ranging in size from No. 12 to 30 grit. Usually the mold face is sprayed with a thin solution of water glass (sodium silicate), and then the abrasive grain applied in the form of a thin layer by use of a suitable sieve. Then the pattern is printed back so as to provide a smooth face, and also to make the abrasive grain bind better. Then the pattern is removed, the mold sprayed again, and another thin layer of abrasive grain is applied. The pattern is printed back again, removed and the mold face is given a final spraying of water glass.

The mold is dried, and after drying the molten iron is poured into the mold. When the casting is removed from the mold it has a facing of abrasive grain which is retained partially through the molten iron flowing between the abrasive grains and partially through the fusion of the sodium silicate (water glass) used.

If the alternate bid means as we think it does, a tough, abrasion resisting structure, it will be necessary to use an alloy iron for that purpose. One that is said to give good service contains about 3 per cent nickel and 1 per cent chromium. The silicon content of the mixture to which the alloys are added should contain around 1.50 per cent silicon, but you may have to increase or decrease the silicon content to suit your particular conditions.

Wants to Produce High Test Gray Iron to Meet Specifications

We would like to know the proper charge for our cupola to produce high test gray iron castings in accordance with Federal specification QQ-I-656. The pig we use contains 3.15 per cent silicon; 0.021 per cent sulphur; 0.59 per cent phosphorus, and 1.12 per cent manganese. In addition to the pig we ordinarily charge medium weight machinery scrap and mild steel scrap.

The specification you mention calls for three classes of iron for light, medium and heavy castings, based on physical tests with a restriction of the maximum sulphur in all cases to 0.11 per cent. In case of the light castings the transverse load minimum is given as 2100 pounds with a deflection of 0.24-inch, and the minimum tensile strength as 28,000 pounds per square inch. The medium class calls for a minimum transverse load is 2250 pounds with a deflection of 0.24-inch, and a minimum tensile of 30,000 pounds per square inch. The heavy casting class requires a minimum transverse load of 2400 pounds with a deflection of 0.24-inch and a tensile strength of 35,000 pounds per square inch.

Since you do not mention which type of castings you intend to make it will be necessary to

suggest possible mixtures for each class which might be expected to give the desired results. However, your particular melting and molding practice will have an effect on the results obtained so that you will find it necessary to compare the suggested charges with your present charges, and make adjustments to obtain the desired results.

For the light class of castings a mixture containing 60 per cent pig iron, 30 per cent medium machinery scrap and 10 per cent steel scrap will give a resulting silicon content of 2.26 per cent and a manganese content of 0.67 per cent. For the medium class a charge composed of 45 per cent pig iron, 35 per cent medium machinery scrap and 20 per cent steel scrap will give a final silicon content of 1.96 per cent and a manganese content of 0.58 per cent. In the heavy class a mixture of 25 per cent pig iron, 40 per cent medium machinery scrap and 35 per cent steel scrap will give a final silicon of 1.51 per cent and a manganese content of 0.48 per cent.

Characteristics of those irons can be changed through the additions of nickel or chromium or both. For example if better machinability is desired, additions of from 0.50 to 1.50 per cent nickel will be of value while if a harder structure iron is wanted chromium from 0.25 to 0.75 per cent should be added. Molybdenum from 0.30 to 1.00 per cent also may be used. However, to give intelligent advice on the most suitable mixture with or without alloys, definite information on the casting and its application must be known.

Specimen Submitted Shows Metal Is Not Melted Properly

We are sending you a sample piece of brass casting to see if you can tell us what is causing the small specks through the metal. We melt in a gas fired furnace using a 150-pound crucible within a reasonable time, the mixture used being our standard 85-5-5-5. This sample is part of a bushing 3½-inches outside diameter and 16 inches long poured with a 1¼-inch down gate into the bottom of the casting, with the pattern pulled up through the cope and left open. These holes are numerous from the top down 10 or 11 inches, and then thin out and almost disappear at the bottom. The metal is poured about medium temperature, as measured by the eye. We would appreciate your suggestions.

The sample of cast 3½-inch solid bar, which you have submitted, indicates a two-fold trouble: The metal has been gassed in melting and the gas bubbles have risen from the bottom of the mold to the top. As they have risen, they have in some instances combined making larger bubbles and exhibiting the condition seen in the sample. The fact that the bottom of these bars is relatively free from such defects simply means that the gases have traveled upward as released by solidification and consequently the metal exhibits a more apparent soundness.

A 1¼-inch down gate is larger than is necessary to properly deliver the metal to the mold cavity. It is impossible to conceive that your pouring stream was sufficiently large to keep this 1¼-inch down gate full and thereby prevent the inrush of air with the molten metal. This air, however, would not give much trouble in open molds such as you describe, except as the end of the pouring was beginning to be reached and the metal consequently was beginning to be sluggish.

In burning gas, you will do well to check regularly the conditions of combustion so as to be sure that you are getting the hottest flame and, consequently, the most completely burned fuel so that there are no underburnt gases that may be absorbed by the molten metal. Such a condition means faster melting, and consequently shorter time during which the metal is exposed to the furnace atmosphere, and also tends to reduce the cost of melting because of this saving in time; but its real importance is seen in the reduction of the amount of underburnt gases available for absorption by the bath.

It would seem probable that your castings would be better if a cope were added to the mold instead of using an open mold as you describe, and then providing the necessary risers for feeding the castings, attaching these risers at the side of the casting rather than on top of them. This at least is better foundry practice and should give you a much better looking casting; consequently, one that would be more saleable. Metal that has not been gassed, poured in such molds, would certainly be a much more inviting product.

Seal 36 inches in diameter cast in a plaster mold of nickel silver by the Ideal Casting Co., Providence, R. I. Illustration courtesy International Nickel Co.

Shake Coal Dust On Molds for Car Wheels

Can you tell us if the use of a cereal binder in our green sand facing will produce a clean skin on our car wheel castings without the use of additional mineral facing material shaken over the surface from a bag.

The prime essential for securing a clean skin on such comparatively heavy castings as car wheels is a highly refractory sand. The refractoriness of the sand is supplemented by the incorporation of approximately 16 per cent coal dust in the layer of sand immediately in contact with the pattern and known as facing sand. This coal dust is finely pulverized bituminous coal. After the pattern is removed, a thin film of powdered anthracite coal is applied to the surface by shaking the material through a bag. This is the commonly accepted practice. In a few places the facing sand is mixed with coal dust, but the coating of anthracite dust, or any of the proprietary compounds known as mineral facing, is omitted. In these instances a synthetic sand, high in silica content and carrying a minimum amount of clay or natural binder, is used. Since this sand is lacking in bond and therefore in cohesiveness, cereal binder is added to render the sand workable.

The cereal binder supplies the necessary green bond while the mold is in process of construction, and later under the influence of heat from the molten iron, helps the sand to retain its shape in the mold. Also, since it is combustible it affects the surface of the sand in contact with the iron, in the same manner as the coal dust in the facing sand, that is prevents it from fusing. Finely ground pitch is used for the same purpose. Briefly the problem boils down to this: If the sand is sufficiently refractory, a facing mixture of 50 per cent new sand, 50 per cent old sand, with coal dust in the ratio of 1 part coal to 6 parts sand, will produce a clean skin on the car wheel castings without the usual facing material shaken through a bag over the surface. If the sand is not sufficiently refractory this supplementary coating is necessary.

Hollow Chilled Rollers Crack in Molds

We are making cast iron chilled rollers 16 inches diameter, 38 inches in length, 1-inch metal thickness with arms and hub cast in both ends. The metal enters the mold at the bottom through four small flat gates on the rim and two on the hub. We are having trouble with the castings cracking. Our cupola mixture contains 200 pounds steel, 500 pounds pig iron and 1300 pounds scrap iron.

We assume that these molds for the chilled rollers are made in the usual manner. A cast iron base supports a flat circular core containing the lower hub print and the lower end prints for the chamber core. The chamber core is made in two longitudinal halves, pasted or wired together. The chill is in halves. In assembling the mold the flat core is placed in the base and the lower hub core is set in place in the center. The main core then is adjusted in place, approximately perpendicular. The two halves of the chill are fastened together and lowered down over the core and come to rest on the base plate. A male and female joint on chill and plate locates the chill. The top hub core then is placed in position and the mold is covered by a flat circular core similar to the one on the bottom. This core contains prints for the hub core and chamber core and automatically centers them in relation to the chill.

A flat strap across the top is clamped to lugs on the chill and holds the core assembly in place. You go to needless trouble and indeed introduce a hazardous element in gating the casting at the bottom. A ring of eight ½ x 1-inch pop gates in the covering core above the rim will introduce the metal to better advantage. You do not state whether the cracks appear in the body or in the arms. Cracks in the body are usually caused by a heavy fin, top and bottom, which prevents the body from contracting normally. The remedy for this is to insure a tighter fit between the upper and lower cores and the chill. Cracks in the arms may be due to one or to a combination of two or more causes.

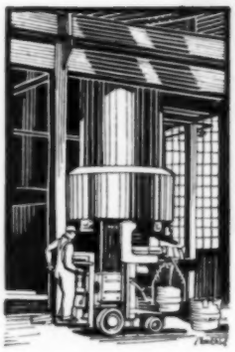
Although you do not give the analysis of the iron it is apparent that the mixture is extremely hard and therefore *shorter* in the grain than ordinary gray iron. This means that it will crack with little provocation. The situation is aggravated by the fact that the outside part of the casting is cooled in the chill more rapidly than the hubs in the center of the core. The large solid dry sand core also sets up opposition to contraction of the casting. To offset these hazardous features the casting is poured on the rim to secure the hottest iron in the outside of the casting. The arms should be reduced in thickness to promote a cooling speed to coincide with that of the body. In a heavy hub the center core should be dug out immediately after the casting has solidified. The main or body core should be bonded with a minimum amount of binder and in addition the interior should be filled with coke or cinders to allow the casting to contract. In some instances it has been found advisable to change the design of the arms either by a longitudinal center rib on the inside, or by a bracket at either end.

Lighting features are unusually attractive at the Great Lakes Exposition being held in Cleveland on the shores of Lake Erie. Illustration courtesy Westinghouse

Fineness of Sea Coal Depends on Facing

Do you think that sea coal ground fine enough to pass through a 260-mesh screen is better than the same coal ground fine enough to pass through a 20-mesh and held on an 80-mesh screen.

The finer sea coal is ground, the more readily is it converted into gas when subjected to the heat of the metal in the mold. On that basis alone the exceedingly fine sea coal is preferable to a coarser grade. Unfortunately the fine sea coal acts like silt in sand and lowers the permeability to a certain extent. Fine sea coal costs more to prepare than coarse sea coal. Confronted with these factors the foundryman is forced to compromise on a grade that will meet his particular requirements satisfactorily. The subject really is too extensive to cover properly in a casual reference. Briefly—and this probably will cover your present inquiry—very fine sea coal is necessary in very fine sand. Increasingly coarser grades are satisfactory for increasingly coarser grades of sand.



Viewing Foundry Developments . . . AT SHORT RANGE

A FOUNDRY pouring a certain type of casting in stacked molds encountered difficulty from gas pockets on the cope side. The defect was eliminated by attaching a number of small pins to the squeezing head of the molding machine which penetrated the sand to within ⅛-inch of the pattern. The upper ends of the pins are attached to metal strips on the board which leave horizontal vent passages in the sand between adjoining copes and drags in the stack.

♦ ♦ ♦

A foundryman attributes his success in obtaining clutch plates without any warpage to the fact that he chills the gate shortly after casting by pouring a small amount of water over it.

♦ ♦ ♦

Annealing to remove casting stresses can be accomplished by heating the castings to 800 degrees Fahr. for 6 to 8 hours according to the thickness, and then slowly cooling in the furnace. The temperature should never exceed 900 degrees Fahr., otherwise carbide disintegration will occur. If the treatment is conducted properly, no loss of strength should occur.

♦ ♦ ♦

WHITE frosted finish for die cast aluminum alloy waffle molds, cooking grills and utensils may be obtained by a double dipping process. First the casting is dipped into a strong hot solution of caustic soda containing 1 to 2 pounds per gallon of water heated to 180 degrees Fahr. until it is uniformly black. Then it is rinsed thoroughly and dipped into a strong acid mixture composed of 3 parts concentrated nitric acid and 1 part concentrated hydrochloric acid at room temperature until all the black smudge is dissolved, and the casting assumes a white frosted finish.

♦ ♦ ♦

A good coating for chills is claimed to be comprised of a mixture of 12½ pounds of red iron oxide in 1 gallon of special oil. In preparing the mixture the red iron oxide should be perfectly dry, and the oil should be heated to a temperature of 212 degrees Fahr. to remove any possible moisture. The oxide is mixed with the hot oil, and when the compound is not in use, it should be stored so that no moisture or dirt can enter.

♦ ♦ ♦

When obliged to hold iron in a ladle for prolonged periods an experimentally minded foundryman has discovered that a covering layer of silocell approximately 2 inches thick is superior to any other material he has tried. Metal in a 10-ton ladle covered in this manner has been held for several hours without any appreciable loss in temperature.

♦ ♦ ♦

INSTEAD of standing in front of a crane ladle with a long skimmer and attempting to hold back any foreign material floating on the iron, an ingenious foundryman has adopted the plan of placing an ordinary firebrick on the metal near the lip. The brick floats on the iron and adapts itself to any fluctuation. The two front corners come into contact with the lining of the ladle and prevent it from flowing over with the stream. It is simple, efficacious and positive in action.

♦ ♦ ♦

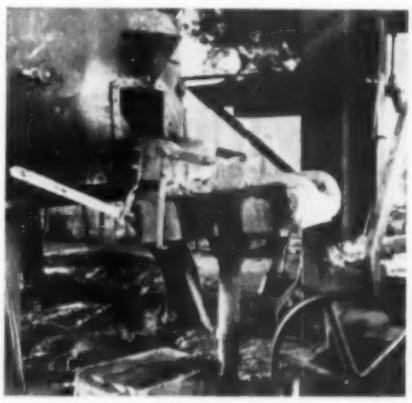
An English firm is claimed to have developed an aluminum alloy which will not oxidize nor tarnish, and which is much cheaper to produce than chromium plating and stainless steel. It is said that the alloy will be used mainly in making machinery used for manufacturing foods, sauces and similar products.

♦ ♦ ♦

A large screen approximately 6 x 10 feet is employed to clean the sand in a general jobbing gray iron foundry where many large castings are molded in the floor. In shaking out these castings the sand is contaminated with broken cores, rods, gaggers and large quantities of coke. A grab bucket suspended from one of the cranes transports this material to a space near a muller type sand mixer and drops it on top of the screen mounted on an incline. The sand falls through the screen and the foreign material rolls off. The screen is hinged to the shop columns at one side and supported on suitable legs at the other side. After serving its purpose the screen is hoisted out of the way by loops on the front side attached to the crane chains. The screened sand then is conveyed by grab bucket to any desired point on the molding floor. Some of the sand is shoveled into the bucket employed in loading the mixer. A piece of loose screen with a finer mesh is placed over the bucket temporarily to more thoroughly clean the sand used for this purpose.

♦ ♦ ♦

SPLASHES incident to passing bull ladles in succession under the stream flowing from the cupola spout are eliminated by the type of spout shown in the accompanying illustration. A spout about 4 feet in length is mounted on a pivot in the center under the short spout attached to the cupola. The long spout is balanced so that it readily may be tipped a few inches in either direction. In one position the sloping spout delivers metal



to the ladle. In the other position the spout acts as a temporary reservoir to hold the metal until the next ladle comes under the end of the spout. A stirrup strap bolted to the short spout prevents the inner end of the long spout from dipping too far. The spout is manipulated by a lever loosely bolted to a strap attached to the short spout. The inner or working end of the lever embraces a bolt in the end of the spout.

Harold Stein

H. L. Campbell

Leslie G. Korte

Elmer J. Carmody

Men of Industry

HAROLD STEIN has been appointed research engineer of the manufacturing department of the Allis-Chalmers Mfg. Co., Milwaukee, succeeding J. FLETCHER HARPER who has retired. Mr. Stein has been connected with the company for 20 years, having joined the organization shortly after his graduation from Tri-State college in 1916 with a bachelor of science degree in mechanical engineering. He served his apprenticeship in the erecting and forge shops and in 1918 was made foreman of the tractor heat treating and forge shop heat treating departments. During the years 1917-20 Mr. Stein took up special work in metallurgy at Marquette university.

In 1925 he was appointed general foreman of the entire forge shop and in 1928 was transferred to the company's research laboratories, serving for 7½ years as assistant research engineer. Mr. Stein has been co-author with Mr. Harper of a number of papers on forging and heat treating subjects, member of the American Society for Metals since its beginning in 1918 and has served on several committees of that society.

♦ ♦ ♦

Leslie G. Korte, foundry engineer, Atlas Foundry Co., Detroit, has been elected chairman of the Detroit Chapter of the American Foundrymen's association. Mr. Korte was born in Detroit in 1901 and received his education in the public and parochial schools of that city, and his technical training at Detroit institute and the University of Detroit. He then started work at the Detroit Stoker Corp., and progressed through the organization, holding various positions including that of toolroom foreman, machine shop superintendent, chief inspector, and finally general superintendent. He resigned on Feb. 1 of this year to become connected with the Atlas Foundry Co.

♦ ♦ ♦

HARRY L. CAMPBELL, for the past 15 years connected with the University of Michigan, Ann Arbor, Mich., as assistant professor of metallurgical engineering, has been made metallurgical engineer, American Hoist & Derrick Co., St. Paul, Minn. Mr. Campbell received his technical training at the University of Michigan, being granted a degree of bachelor of chemical engineering in 1914 and master of science in 1921. After graduation, he secured industrial metallurgical experience with plants at Marine City and Bay City, Mich.

Mr. Campbell has given a large amount of attention to research work on foundry core practice, molding sands, and cupola operations, and has presented papers before the American Foundrymen's association. He has recently written a book entitled "Metal Castings."

♦ ♦ ♦

DIMITRY NICONOFF, J. G. DONALDSON and L. H. BERKELHAMER have been appointed to the technical staff of Battelle Memorial institute, Columbus, O. Mr. Niconoff, formerly metallurgist for the Phelps-Dodge Corp., has been appointed research metallurgist in the process division. Mr. Donaldson, formerly with the Laclede Steel Co., has been assigned to the chemical division. Mr. Berkelhamer, formerly a bureau of mines fellow at the University of Washington, has been placed with the ceramics division.

♦ ♦ ♦

JOHN E. BURLENBACH, formerly secretary and treasurer of the Bierman-Everett Foundry Co. Inc., Irvington, N. J., is president and treasurer of the newly organized Burlenbach Foundry Co., Quakertown, Pa. E. C. SHOEMAKER, Atlantic City, N. J., has been made vice president of the company and H. E. BURLENBACH, Milburn, N. J., secretary.

♦ ♦ ♦

L. A. Bridges has resigned as foundry superintendent of the Brass Foundry Co., Peoria, Ill., and now is residing at Marietta, O. Mr. Bridges has been connected with the foundry industry for 26 years, during the last 10 has held several positions including that of foundry superintendent, Barnes Foundry Co., Cleveland; foundry superintendent, Klotz Machine Co., Sandusky, O.; and foundry superintendent, Brass Foundry Co., Peoria, Ill.

♦ ♦ ♦

ELMER J. CARMODY, formerly connected with the Campbell, Wyant & Cannon Foundry Co., Muskegon, Mich., has been made chief metallurgist and chemist, Superior Engine division, National-Superior Co., Springfield, O. Mr. Carmody received his bachelor of science degree in mechanical engineering from Michigan State college and his master of science degree in me-

(*Continued on page* 40)

EXPERIENCE COUNTS

. . . . . HERE GUESS WORK PLAYS NO PART

Experience—computed in terms of efficient operation and low maintenance cost—and multiplied by hundreds of installations, where the record of Bartlett-Snow equipment has been gratifying alike to the purchasers and ourselves—*is at your disposal.*

Nor is this important asset limited to certain fields . . . confined to prescribed conditions. In brass, aluminum, steel, malleable and gray iron foundries for more than 20 years the words "Bartlett-Snow" have been synonymous with "Proven in Service."

Small wonder that officials of large and small, of jobbing and production foundries, turn to Bartlett-Snow for their equipment. Follow their example. Then, you too, will secure the advice of experts, whose wide familiarity with practical, rather than theoretical problems, has enabled scores of companies to enter new fields of efficient low cost operation.

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BARTLETT-SNOW
foundry Equipment

Shakeouts • Aerators • Pug Mills • Mullers • Mixers
Hoppers • Mold Conveyors • Core Ovens • Air Filters

(*Continued from page* 38)
chanical and chemical engineering from the same institution. He also has been connected with the Saginaw Malleable Iron Co. division of General Motors Corp., Saginaw, Mich., and the Oliver Farm Equipment Co., South Bend, Ind.

♦ ♦ ♦

JOHN C. HASWELL recently was elected chairman of the board, and WILLIAM B. RUNYAN was made president and general manager of the Dayton Malleable Iron Co., Dayton, O.

Mr. Haswell was born in Galveston, Texas, in 1867. He started his business career in Hoosick Falls, N. Y. and for some time was connected with the Walter A. Wood Co. In 1897 he became general manager of the Marion Malleable Iron Co., and in 1915 he was made president and general manager of the Dayton Malleable Iron Co. Mr. Haswell has been connnected with other foundry interests in Ohio, Indiana and Illinois, and is a director of the National Cash Register Co., Dayton. He also is a director of the Malleable Founders' society and the Ohio Manufacturers' association.

Mr. Runyan was born in Mansfield.

John C. Haswell

O. He was associated in various capacities with the Ohio Brass Co. for 7 years immediately prior to February, 1913, when he was appointed superintendent of the Dayton Malleable Iron Co. In February, 1920, he was elected vice president and general superintendent, holding that office until his elevation to the presidency and general managership.

♦ ♦ ♦

ELMER A. SCHNEIDER, formerly owner of the Mishawaka Pyrometer Instrument Co., has been made production manager for the Wheelco Instruments Co., Chicago. Mr. Schneider also has been connected with the Leeds & Northrup Co., the Brown Instrument Co., and the Pyrometric division, Republic Flow Meter Co.

GEORGE W. KELLER, formerly vice president, Brown Instrument Co., has been placed in charge of the eastern sales division of the Wheelco company.

♦ ♦ ♦

J. H. REDHEAD, recently elected executive vice president and general manager of the Erie Malleable Iron Co., Erie, Pa., continues actively in charge as president and treasurer of the Lake City Malleable Co., Cleve-

J. H. Redhead

land. In addition, he has for several years been operating the malleable division of the Warren Tool Corp., Warren, Ohio.

Previous to assuming the presidency of the Lake City firm he was associated with the National Malleable & Steel Castings Co., Cleveland, in various executive capacities and later was vice president and general manager of the Columbus Malleable Iron Co., Columbus, Ohio.

Among those associated with Mr. Redhead in these enterprises are the following:

PAUL FRUM, chairman of the board of Warren Tool Corp., attorney with the firm of Baker, Hostettler & Sidlo, Cleveland.

CARL M. BEATTIE, for over 20 years, and until recently, president of the Jewell Alloy and Malleable Co. Inc., Buffalo. Mr. Beattie is now located in Cleveland at the Lake City Malleable Co.

LAMOTTE HENRY, Toledo, O., formerly with Buhl Malleable Co, Detroit, and the Maumee Malleable Castings Co., Toledo. For the past several years, Mr. Henry has been handling sales in Toledo and western Ohio for the Lake City Malleable Co. Mr. Henry also handles sales in Michigan and the Detroit area for Cadillac Malleable Iron Co.

JOHN B. COATES, for many years vice president and general manager of the Pittsburgh Malleable Iron Co., is handling sales in the Pittsburgh area for the Lake City Malleable Co.

R. C. SHURMER and R. J. MUELLER have been identified with the malleable industry for many years and continue with the Lake City organization.

RAY D. DUMARS, formerly with Warren Tool Corp. and Meadville Malleable Iron Co, is now handling sales for the Lake City Malleable Co. in the Warren area and southern Ohio.

♦ ♦ ♦

W. P. DALRYMPLE, Bowen road, New York, has been appointed Buffalo representative of Claude B. Schneible Co., Chicago.

♦ ♦ ♦

IRVING P. MACAULEY has been elected vice president of the Reynolds Metal Co. Inc., 19 Rector street, New York.

♦ ♦ ♦

F. E. HARDIN, assistant to Frederick E. Williamson, president of the New York Central railroad system, has resigned that post to assume the presidency of the Association of Manufacturers of Chilled Car Wheels. He will take up his new duties Sept. 1.

♦ ♦ ♦

P. K. REED has joined the engineering and sales organization of C. O. Bartlett & Snow Co., Cleveland. For

William B. Runyan

many years he was chief engineer of the R. H. Beaumont Co., later becoming manager at Chicago for that company and more recently president of the Atlas Conveyor Co.

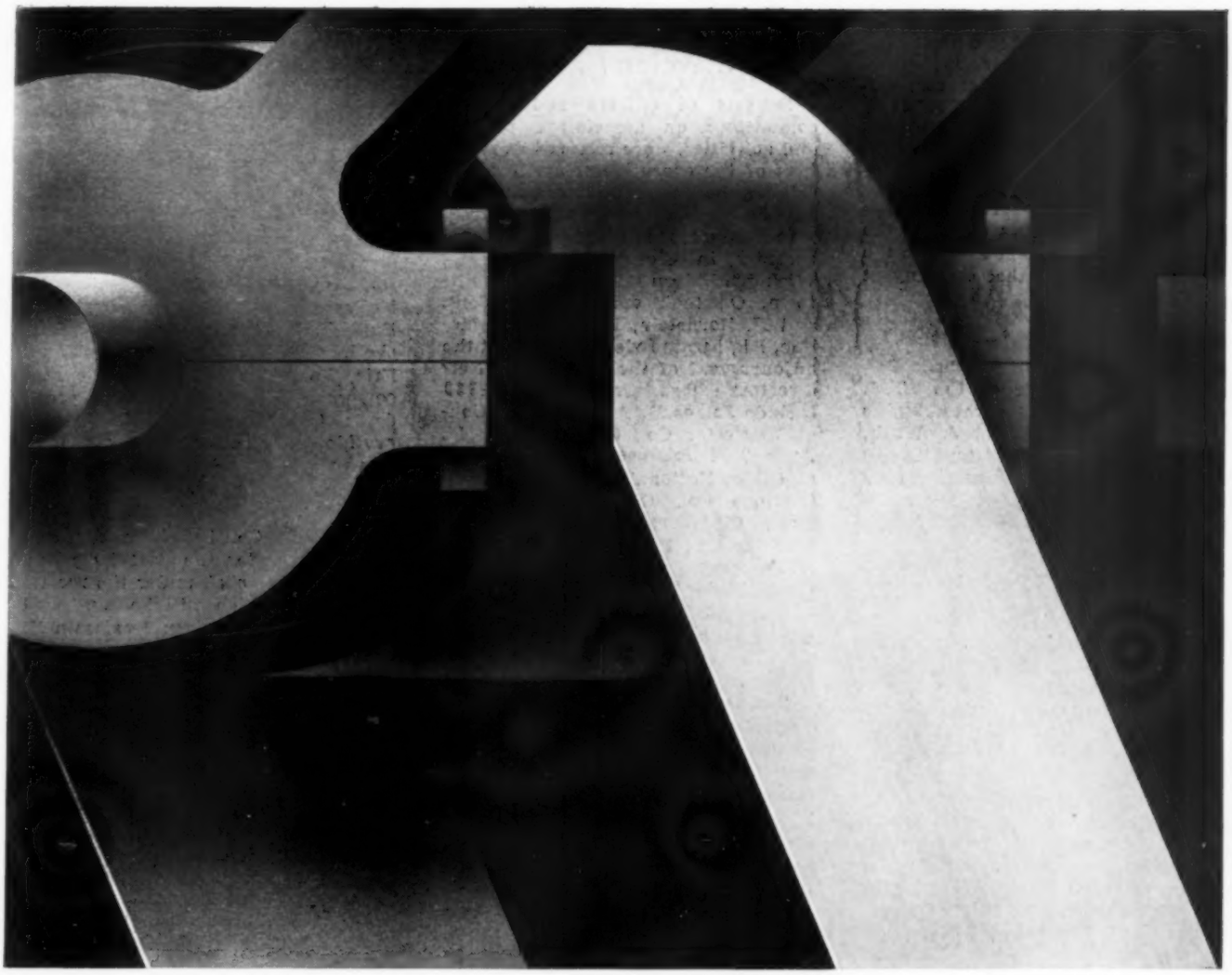
♦ ♦ ♦

CARL NYGREN, formerly with Sullivan Machinery Co., Michigan City, Ind., has been appointed chief engineer of Michiana Products Corp., Michigan City.

♦ ♦ ♦

PROF. K. H. DONALDSON has been made chairman of the newly formed Cleveland section of the American Institute of Mining and Metallurgical Engineers, which includes Cuyahoga, Lake, Summit, Stark, Lorain, Geauga, Portage, Ashtabula, Trumbull and

(*Concluded on page* 42)



MOLY for WEAR

WHENEVER a product is faced with stiff operating requirements, price is not the final measure of its value or economy. "How well will it wear? How long will it last?" Its answers are the real sales-closing factors.

A manufacturer of fuel-oil pumps found that out. His competitive success, he discovered, depended on the steel he selected for rotors. It had to have exceptional hardness to resist wear and to combat the corrosive effects of various types of fuel oils.

A Chrome-Moly (SAE 4130) cyanided rotor was the solution. Not only was it found to take an extremely hard case, but it involved less hardening and machining costs. Thus, while searching for one advantage, two were found, viz., higher quality and lower production cost.

Your problems may be simpler. Or they may be even more complicated. In either case, it will pay you to investigate Moly steels. Their almost limitless range of applications is envisioned in our technical book, "Molybdenum." We invite engineers and production heads to write for it. Also ask to be placed on the mailing list of our periodical news-sheet, "The Moly Matrix." And — if you've a peculiar alloy problem needing further study, our experimental laboratory facilities are at your command. Climax Molybdenum Company, 500 Fifth Ave., New York City.

CUTS COSTS Mo-lyb-den-um CREATES SALES

MOLY

(*Concluded from page 40*)

Mahoning counties. Other officers are: C. H. LUNGE, vice chairman; J. M. FENNER, secretary and treasurer; DR. H. A. SCHWARTZ, PROF. H. M. BOYLSTON and C. B. MURRAY, executive committee.

* * *

G. E. MAHONEY, formerly a sales engineer in the Milwaukee offices of the Chain Belt Co., has been moved to the Pittsburgh offices of that company at 526 Grant building.

♦ ♦ ♦

JOHN R. WARK has been made Buffalo branch manager of the E. J. Woddison Co., Detroit, succeeding his father, the late William J. Wark. Mr. Wark has been assistant to his father in the Buffalo office for many years.

♦ ♦ ♦

WILLIAM E. LEARY has been appointed secretary, treasurer and general manager of the Bierman-Everett Foundry Co., Irvington, N. J. He was formerly identified with the Sacks-Barlow Foundries Inc., Newark, N. J., and prior to that with other foundries in the Northern New Jersey district.

♦ ♦ ♦

F. E. DUNLAP, who has specialized in sand handling, foundry and automotive equipment for Stephens-Adamson Mfg. Co., Aurora, Ill., has been appointed branch manager in charge of conveyor sales and engineering for the state of Michigan, with offices in Book Tower, Detroit.

♦ ♦ ♦

H. H. DOEHLER, formerly president of Doehler Die Casting Co., Toledo, O., has been elected president of the board of that company. F. J. KOEGLER, formerly vice president and treasurer, was named president and L. H. PILLION was appointed executive vice president. R. BERNHARD was elected treasurer and F. KNOEBEL, secretary.

♦ ♦ ♦

S. C. DUTOT recently has been made Chicago district manager of Electro Metallurgical Sales Corp., New York. He has been associated with the ferroalloy business for more than 20 years. For the past 12 years he has been engaged in sales activities of the company in New York and Chicago territories. Prior to 1924, Mr. Dutot was employed as chemist at the Niagara Falls plant of the Electro Metallurgical Co.

Firms Consolidate

Patent Specialty Supply Co., formerly of Cambridge, N. Y., has been consolidated with the Lovejoy Chaplet Co., Hoosick Falls, N. Y. under the name of Lovejoy-Patent Specialty Co. Inc., with headquarters at Hoosick Falls.

A.F.A. Directors Hold Cleveland Meeting

Reports of officers and special committees on association policies and activities, were received at meetings of the executive committee, the retiring board of directors and the new board of directors of the American Foundrymen's association held recently in Cleveland. James L. Wick Jr., Falcon Bronze Co., Youngstown, O., took office as president, and H. Bornstein, Deere & Co., Moline, Ill., became vice president at the adjournment of the old board. New directors whose terms expire in 1939 include James R. Allan, International Harvester Co., Chicago; Dan M. Avey, THE FOUNDRY, Cleveland; Carl C. Gibbs, National Malleable & Steel Castings Co., Cleveland; Marshall Post, Birdsboro Steel Foundry & Machine Co., Birdsboro, Pa.; and L. N. Shannon, Stockham Pipe Fittings Co., Birmingham, Ala.

C. E. Hoyt, was re-elected executive secretary, treasurer and manager of exhibits; R. E. Kennedy, technical secretary; Jennie Reininga, assistant secretary-treasurer; E. O. Jones, director of the safety and hygiene section; and Norman F. Hindle was made assistant technical secretary, a newly created position.

Directors Dan M. Avey, E. O. Beardsley, L. S. Peregoy and W. L. Seelbach were elected to serve with the president, vice president and executive secretary as members of the executive committee of the board.

Following organization, consideration was given to recommendations contained in the reports of officers, the executive committee and the special committee on association policies nd activities. The latter committee, of which Frank J. Lanahan, Fort Pitt Malleable Iron Co. is chairman, was continued.

The board voted unanimously to continue the work of the safety and hygiene section, organized in January, 1936, with E. O. Jones as director. A view of making practice uniform in the several industrial states, all foundrymen, whether members of the A.F.A. or not, who have engineering, medical or legislative problems in connection with their safety and hygiene programs are invited to correspond with the director of that section.

The board voted to support the research on effect of elevated temperatures on molding sand, by raising funds through subscription from firms which have benefited financially from the committee's extensive work on sand control.

The board also approved a request of the steel division for funds for the preparation of a treatise on the designing of steel castings.

Invitations for the 1937 and 1938 conventions of the association were referred to the executive committee for further consideration and report.

Erie Malleable Firm Is Reorganized

Receivership of the Erie Malleable Iron Co. has been dissolved and the firm reorganized with the following directors: Archibald Brown, Joseph Roebling, Trenton, N. J.; Robert H. McCarter, Newark, N. J.; Charles H. English, Enoch C. Filer, A. W. Mitchell, and Charles G. Strickland, Erie, Pa. The officers of the new company are Enoch C. Filer, president; Charles G. Strickland, vice president; J. H. Redhead, executive vice president and general manager; Ray H. Eisenlord, secretary and treasurer.

The Erie Co. has been operated continuously for the past 50 years. The operating staff under the receivership and which will be continued includes the following: Benjamin H. Scott, general sales manager; Joseph J. White Jr., salesman; Paul Urick, Kondu salesman; Lester J. Hannon, production manager; W. C. Culbertson, purchasing agent, Edwin J. Hay, foundry superintendent; Walter H. Fegely, chief engineer; Paul H. Vincent, manager wheel division; J. W. Vanderveer, consulting engineer, wheel division; Samuel Malthaner, engineer wheel division; Ralph J. Oboth, manager, Urick foundry division.

Made Sales Agent

A. L. Cavedo & Co., Richmond, Va., miners and shippers of molding sand, have been appointed sales agent for the Federal Foundry Supply Co., Cleveland, in the southeastern section which includes Virginia, District of Columbia, North and South Carolina, and eastern Tennessee. N. L. Cavedo, vice president, will be in charge of the Federal line.

Appointed Representative

Ferdinand G. Schultz Co., 215 Questend avenue, Pittsburgh, has been appointed representative of Herrington & Randall Inc., Detroit, for the sale of industrial ovens in the Pittsburgh territory.

John T. Rowntree Inc., Los Angeles, Calif., has been appointed western representative by the Cleveland Quarries Co., Cleveland, for the sale of its silica firestone. The Rowntree company, in addition to its headquarters at Los Angeles, has offices at San Francisco; Portland, Oreg.; Salt Lake City; Denver and Seattle.

A Panoramic View of the White Rock Silica Company of Wisconsin, Browntown, Wisconsin—Deposit and Plant

SILICA
SAND • • • FLOUR

Announcing the appointment of the White Rock Silica Company—Harry Haze, President; John Grant, Vice President; offices at

2105 TRIBUNE TOWER
CHICAGO, ILLINOIS

as exclusive distributors for White Rock Silica Company of Wisconsin, Browntown, Wisconsin, specializing in the production of quality silica sands and flours. An analysis of samples drawn by representatives of the Robt. W. Hunt Company *shows a silica content of 99.51%.*

PLANT CAPACITY 25 CARS DAILY

All grades of crude, washed, dried and graded silica sand and flour have *guaranteed uniformity.* Your inquiry will be greatly appreciated.

SOME EXCLUSIVE TERRITORY OPEN TO DEALERS—WRITE US!

•

Our Mr. Haze pioneered the Production of LABORATORY CONTROLLED, UNIFORM QUALITY, HIGHLY COLLOIDAL, WYOMING BENTONITE. *We can supply you with your requirements of this product on a competitive price basis, either immediate shipment or on contract for future requirements.*

PLEASE SEND US YOUR INQUIRIES.

WHITE ROCK SILICA CO.

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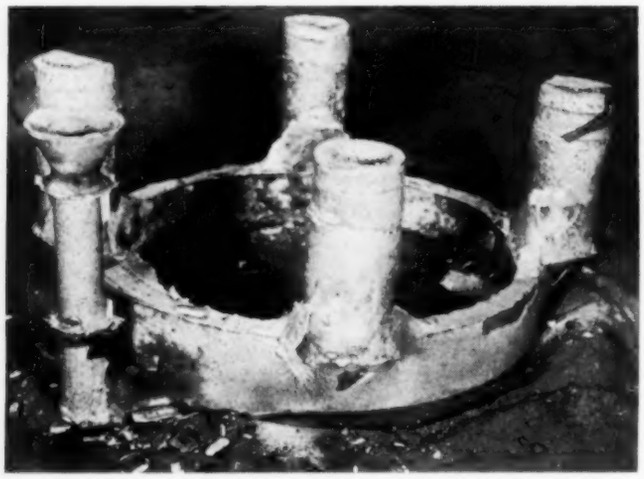

Skin dried green sand mold produces clean, solid castings

Green Sand Used for Steel Castings

By WILLIAM F. ROSE

GREEN sand molds are particularly well adapted to the production of steel castings subjected to high pressure and where extensive machining, assembling and other operations amount to a considerable item in the total cost. Under proper conditions the physical properties of steel cast in green sand molds equals those found in forgings and rolled shapes and the cost is much less. Where quick delivery is a factor, it is obvious that green sand presents a decided advantage over dry sand.

A steel ring casting just after it was taken from a green sand mold is shown in the accompanying illustration. This casting is to be machined all over and dovetailed into a second ring for use in a wheel mold where plastic material is subjected to a pressure of 4000 pounds per square inch. Formerly these rings were forgings or rolled steel. Under the present foundry technique the rings cast in green sand molds are solid and homogenous and free from strains. The face of the mold is skin dried. Metal at a temperature of 2900 degrees is poured into a large sprue which extends to a gate at the bottom of the mold. The gate is set at a tangent so that the metal readily flows around in the mold instead of striking the core at right angles. The sprue is 2.75 inches in diameter and each of the four risers or feeders is 6 inches diameter and 18 inches high. The illustration shows that the green sand not only resisted the heat of the metal but also resisted any erosive action. The skin is perfectly clean. The mold also permitted the casting to contract normally and thus prevented internal strains or the formation of cracks.

In many plants the usual practice in making castings of this kind is to dig out the center of the mold and fill the cavity with dried sand. The practice is based on the theory that the weakened mold will yield when the casting contracts. Experience in the foundry where this ring was made indicates that this practice of forming a hollow place in the mold is not necessary where the sand is prepared properly. The sand is reclaimed sand that has been thoroughly cleaned, milled with an organic binder for 5 minutes and tempered with a 10 per cent solution of molasses water. Permeability is 385, bond 2.40 and moisture content 5.50 as measured by the equipment made by the H. W. Dietert Co., Detroit. According to the usual practice in the plant the mold was rammed extremely hard.

Discuss Practice In Mechanized Foundry

The annual meeting of the New Jersey Foundrymen's association was held June 17 at the Downtown club, Newark, N. J., as the last regular function of the association until next fall. The program was featured by addresses of M. L. McGuire, formerly superintendent, General Electric Co. foundry, Elizabeth, N. J., and William P. Laytham, president, William P. Laytham & Sons Co., Paterson, N. J.

Mr. Laytham and Mr. McGuire discussed "Foundry Practice in a Mechanized Foundry". Using specimen and lantern slide illustrations, the two men referred to problems of cupola practice, cupola refractories, gating, risering and pattern design. Continuous pouring, conveyor molding, mechanical sand condition and mechanical charging were among other phases of practice discussed in regard to a mechanized foundry. A special method for obtaining soft iron in small castings from a low silicon high scrap mixture was given particular emphasis also by the speakers.

The nominating committee has nominated the following members for the five vacancies to be filled this year on the board of directors: A. J. Graf, William P. Laytham, R. E. Moore, J. C. Phelan and W. H. Winters.

Book Review

Metal Castings, by Harry L. Campbell, M. S., formerly associate professor of metal processing, college of engineering, University of Michigan, Ann Arbor, Mich.; cloth, 318 pages 6 x 9 inches, published by John Wiley & Sons Inc.; supplied by THE FOUNDRY for $3.15, and in Europe by the Penton Publishing Co., Ltd., London.

According to the foreword the textbook has been prepared to assist in the organized study of the materials and processes employed in the production of metal castings. The reasons for the selection of materials and the procedure used in the manufacturing processes are explained. Special consideration is given to the constitution, properties and classification of cast ferrous and nonferrous alloys. Relationship of design to the production of metal castings constitutes an important division. A bibliography following each chapter furnishes reference for readers who desire additional information. Each chapter also is followed by a series of review questions. Tabulated data, standard specifications for cast metals and foundry control methods are presented in the concluding pages. A four page cross index covers the subject matter.

The book is well illustrated, and while the various points are covered briefly, the presentation is sufficiently explanatory for students and others who desire a general, rather than a minutely specialized description of every factor involved in the production of castings.

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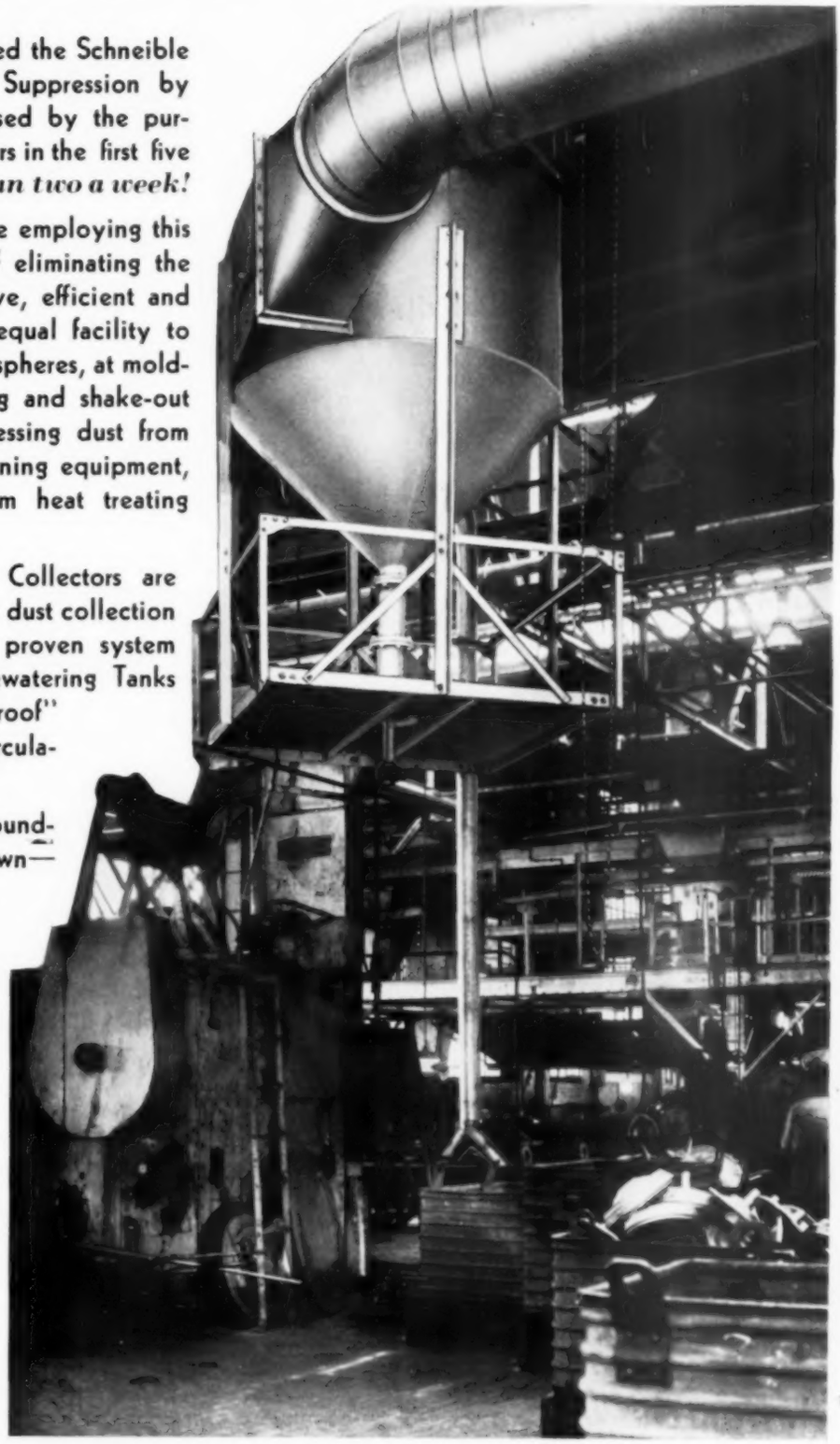

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Shrinkage

by H. A. Schwartz

Ninth Installment

Problem 17 (*Concluded*)

WITH this suggestion for a method of experimental attack upon any given concrete problem we leave finally the question of the size of feeders for certain other aspects of the shrinkage problem. The first of these is the question of the feeder mouth. For two reasons, convenience in removal of feeders and rendering the cooling rate of the feeder relatively less dependent on the cooling rate of the casting, it is desirable to have the feeder communicate with the casting through a mouth of fairly small cross section. Now it is plain that such a mouth would have a larger value of Z than the feeder or casting, freeze up early, and render the feeding operation inoperative. Indeed, it is quite possible that this may happen and it often does in practice where the design is improper. To avoid this condition we must minimize the heat loss radially outward from the circumference of the mouth and this can in fact be accomplished by making the temperature gradient in the sand surrounding the mouth much less steep than it normally would be.

Let us take for discussion a cylindrical feeder attached by a round mouth to the upper (flat) surface of the casting to be fed. The mouth may be considered a very short cylinder. For simplicity consider the mold to be also cylindrical and of radius R, the radius of the feeder being R_1 and of the mouth R_2. The ratio of circumference to diameter of the feeder is as we have seen before,

$$\frac{2\pi R_1}{\pi R_1^2} = \frac{2}{R_1}$$

and similarly the ratio for the mouth is $\frac{2}{R_2}$. If θ be the temperature of the metal (above that of the outside of the mold) the temperature gradient from the feeder to the surface is $\frac{\theta}{R-R_1}$ and that of the mouth $\frac{\theta}{R-R_2}$. If the mouth and feeder are to cool at the same rate,

$$\frac{2}{R_1}\,\frac{\theta}{R-R_1} = \frac{2}{R_2}\,\frac{\theta}{R-R_2}$$

$$R R_2 - R_2^2 = R R_1 - R_1^2$$

$$R_2^2 - R R_2 = R_1^2 - R R_1$$

$$R_2 - \frac{R}{2} = \pm\left(R_1 - \frac{R}{2}\right)$$

$$R_2 = R_1 \text{ or } R_1 + R_2 = R$$

There are thus an indefinite number of pairs of values of R_1 and R_2 which in a mold of given size will cause the mouth to freeze at the same rate as the feeder and also the entirely obvious relation that if the feeder and mouth are of the same radius they cool at the same rate.

This solution is, however, practically not especially useful for it plainly not always is possible to make a feeder and mouth so large that the sum of the radii is the radius of the mold. However, we have recourse to the fact that if the wall of sand between feeder and casting, whose thickness is the length of the mouth, is thin then it will heat rapidly from the bottom of the feeder and the top of the mold. The temperature at any given level will be nearly constant along a radius and since there is a negligible temperature gradient, the cooling rate will be very slow.

The temperature, θ, at the center of a "slab" of sand of thickness, l, in time, t, after its surface is heated to θ_0 above its original temperature can be calculated[37] and is shown for various values of t and l in Fig. 28.

The figure shows that if we make this sand wall fairly thin, i. e., the mouth short, say 1 centimeter (0.4 inch) the mold material will heat very promptly up to a temperature not far removed from that of the cooling metal. After 2 minutes or so the temperature of the sand below the outer edge of the feeder will be practically identical with that of the molten metal and the radial gradient through the sand will have become very small, say for example, not over $\frac{0.1\,\theta}{R_1 - R_2}$ where R_1 and R_2 are, as before, the radii of feeder and mouth respectively. Meanwhile the

(*Continued on page* 48)

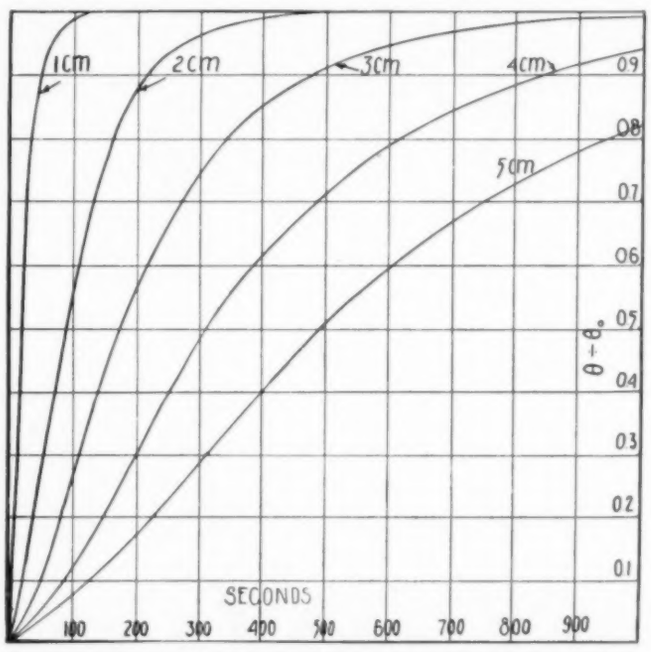

Fig. 28—Temperature at center of slab of sand for various values of t and l

Footnote references will be found at the end of this installment starting on page 51.

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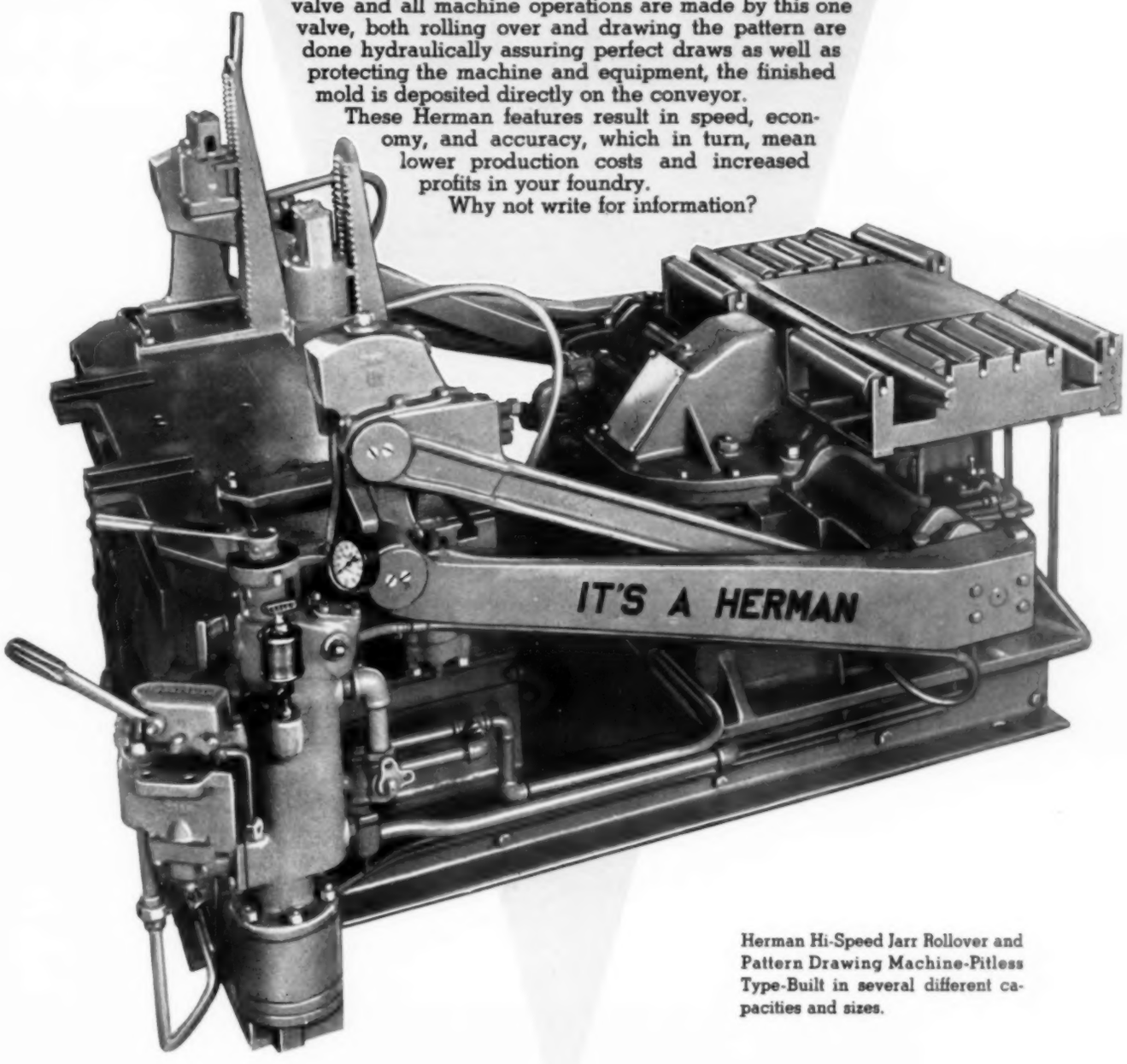

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(*Continued from page* 46)

gradient for the feeder is $\frac{\theta}{R-R_1}$ where R is the mold radius. Now the cooling rate of mouth and feeder for equal gradients would be in the ratio $\frac{R_1}{R_2}$ hence if

$$\frac{0.1\,R_1}{R_1-R_2} = \frac{R_2}{R-R_1} \qquad (21)$$

the mouth and feeder would cool at the same rate. By substitution of known values for R and R_1 the equation may be solved for R_2 a size of mouth which will freeze just as fast as the feeder.

Since the equation is a quadratic there will be two solutions at which the mouth and feeder freeze simultaneously. That value of R_2 for which $(R_1-R_2)R_2$ is greatest will have the slowest cooling rate possible with the given conditions and all values of R_2 lying between the two solutions of the quadratic equation will cause the feeder mouth to freeze more slowly than the feeder. By the usual methods[58] it can be shown that the most effective value of R_2 is $\frac{1}{2}\ R_1$. The feeder mouth should therefore be about one-half the diameter of the feeder and the bottom of the feeder should approach the casting as closely as possible, i.e. the neck at the mouth should be as shut as possible.

The subject of the design of feeder mouths can not be abandoned without devoting a few lines to certain hydraulic principles which must be fulfilled if a feeder is to function. The simplest and most conclusive is the ludicrously obvious one that the level of liquid metal in the feeder must be higher than that in the casting, for metal, like water, can not flow up hill. To this generalization there are some exceptions, for it can be sucked up hill and sometimes is.

The force causing the flow of liquid metal is first the pressure of a column of liquid metal whose height is the difference in level of the liquid in the casting and feeder. If the liquid *completely* fills a solid shell of the casting which has already frozen and is rigid enough to sustain atmospheric pressure there is added to this pressure that of the atmosphere (practically 15 pounds per square inch or 1 kilogram per square centimeter). The addition of atmospheric pressure is merely equivalent to adding to h, the difference in level of liquid an amount, $\frac{1000}{\rho}$ for the column of liquid required to produce atmospheric pressure has a height such that the product of this height times the metal's density is atmospheric pressure (1000 in meter units). Now it is well known that the velocity of flow, friction being absent, through an orifice is that acquired by a particle in falling through a height equal to the pressure head of the liquid, here $h + \frac{1000}{\rho}$. This velocity is $\sqrt{2g\left(h+\frac{1000}{\rho}\right)}$ where g is the acceleration due to gravity 981 (centimeters per second, per second)[59]. Volume of metal entering the mold in unit time then would be the unfrozen area of the mouth, a times the velocity, or

$$a\sqrt{2g\left(h+\frac{1000}{\rho}\right)}$$

Be it noted that the amount of metal freezing per unit time is constant and determined by conditions just previously discussed which depend upon the cooling coefficient of the casting, Z, and the melting point and latent heat of fusion of the metal. Z in turn is determined by the form and dimensions of mold and casting. The shrinkage being ϕ times the volume of metal freezing per second is thus constant. The value of a and h, however, continually decreases as the casting feeds and the feeder and mouth freeze. Even at the last moment therefore $a\sqrt{2g\left(h+\frac{1000}{\rho}\right)}$ must not decrease to a value less than that calculated as necessary to make up the change of volume during freezing. This will be recognized to be

$$\frac{0.0037\,Z\,\theta_f\,V\phi}{\rho\,L}$$

where V is the volume of the casting.

Since we already have learned to calculate the time required for the casting to freeze we can calculate the unfrozen area, a, of the mouth at that instant and consequently to calculate the value of h necessary to maintain the required rate of flow.

We also previously have solved the problem of the rate at which metal sinks in a feeder so that we may compute the initial height of feeder required so that the requisite height, h, of liquid metal will remain at time, t. One must not forget that h is a difference in level between the liquid metal in the feeder and casting. If the feeder has been effective, then the level of liquid in the casting at the last moment when liquid exists is at the feeder mouth, hence for our problem the final value of h, i.e. that which determines our solution is the level of the liquid above the feeder mouth. The use of this reference level must be recognized in describing the original height of metal in the feeder. The simpler solutions previously considered are correct only for quite slow freezing rates.

For those who are not content with the assumptions previously made as to the heat distribution in relatively thin layers of molding sand, namely that the outer surface of the mold rises but slowly and that, from a plane surface, the heat gradient is a straight line, means[60] exist for checking the error in this assumption.

The error as to exterior temperature is not great for the relatively small time intervals in which we are interested before the metal freezes. The gradient does not, however, become rectilinear at once.

We have constantly avoided a discussion of the cooling rate of very small bodies cast in very large sand molds. This condition is approached rather frequently in the foundry making small castings and indeed at the sharp corners and edges of large objects. Methods exist for discussing the heat distribution resulting in the sand but unfortunately these methods[61] assume for simplicity that the small body cools instantly.

Fortunately small bodies cool so rapidly as to freeze before pouring is complete in a manner similar to, but more extreme, than discussed for the tapered ingot so that we have but little occasion to concern ourselves with shrinkage.

The equations of the foot-note represent a wave of temperature passing away from the source of heat. Each layer of sand first rises in temperature and then falls and at every time the temperature is a maximum at some layer, just which one depends on the time. It therefore is evident that sharp points and edges produce so different a heat distribution in the mold than those existing at larger surfaces that the cooling condition there must be very abnormal. All that can be said of practical value is that the cooling rate is extremely rapid.

Most of the preceding discussion has been founded on an assumption that the casting is of uniform temperature throughout. In any blocky casting this is probably somewhat nearly true. However, in castings of considerable length and especially where the cross section is in places small, we may depart considerably from the truth in making this assumption.

Consider a dumb-bell shaped casting in which the bells or balls are of unequal size. Particularly in a symmetrical mold their Z values, considering each ball as a separate object, may be decidedly different and hence their cooling rates will also be decidedly different. Heat will then flow through the bar or grip according to the well known law that the heat conducted is the product of the cross sectional area, the temperature difference between the ends of the bar and the metal's conductivity all divided by the cross section of the joining bar. It is a simple matter to determine whether this rate of heat

(*Concluded on page* 51)

ADVERTISING PAGES REMOVED

(*Concluded from page* 48)

transfer which cools the large ball and heats the smaller by amounts varying inversely as the ball's mass is or is not negligible compared with the temperature differences produced by variations in cooling rate.

Where substantial uniformity of temperature is not to be expected it is usually necessary to consider each portion of a casting as a separate unit and provide it with its own feeders. This involves practical complications quite as great as those of calculations. Differences of temperature between different parts of the same castings are reflected in cooling strains which set up forces within a casting which may have serious consequences either during freezing and cooling, or even when cold. The calculation of such stresses is possible only when the metal is cold enough to be perfectly elastic. The behavior of the metal under stress at high temperature when the metal can be deformed somewhat like a viscous mass presents a problem of extreme difficulty of solution. We will not in this discussion attempt any further quantitative discussion of the forces developed in castings when constrained during cooling.

An attempt has been made in the preceding pages to set up a basis for an at least approximate quantitative treatment of the shrinkage problem. No one can realize more than the writer the difficulty of reducing this matter to any simple terms. The intent has been to bring each problem's solution into such form that it can be used by those who can substitute in a formula or read a graph. That the intervening steps require more mathematics than this, is unfortunate but unavoidable. Nevertheless, it is hoped that the reasoning involved, contained mainly in foot-notes, can be intelligently read by those who have had the usual engineering preparation in mathematics. The extension of the material into original fields would probably require fairly good facility in mathematics.

We have limited ourselves to fairly simple conditions and have attempted to simplify these still more by certain more or less justifiable assumptions. A vigorous treatment of complicated objects would be far beyond our ability. This treatment appears justified for the intent of this discussion has been rather to develop principles by a study of simple cases than to make it possible to calculate the feeding system required for a complex job. If the reader is able to use the principles here illustrated by examples as a guide in experimenting with the feeding of castings, that is all that can be hoped for.

The End

[57] Ingersoll and Zobel, page 108, Equation 129,

$$\theta=\theta_0\left(1-\frac{1}{\pi}\left(2\sqrt{\frac{h^2\pi^2 t}{l^2}}-\frac{1}{3}\sqrt{\frac{h^2\pi^2 t}{l^2}}^3+\frac{1}{5\cdot 2!}\sqrt{\frac{h^2\pi^2 t}{l^2}}^5-\frac{1}{7\cdot 3!}\sqrt{\frac{h^2\pi^2 t}{l^2}}^7+\cdots\right)\right)$$

in which for sand $h^2=.0049$ and hence $h^2\pi^2=0.048$. For conditions where θ is to be at all close to θ_0 the terms of the series in which the exponent of e is numerically greater than $-\frac{h^2\pi^2 t}{l^2}$ are negligible.

[58] $d\cdot(R_1R_2-R_2^2)=R_1\,d\,R_2-2R_2\,d\,R_2$

$R_1-2R_2=O$ for max. (or min.) value of $R_1R_2-R_2^2$.

$R_1=2R_2$

[59] If the iron were to flow through a channel of considerable length and small cross section it would be necessary to reduce the value, $h+\frac{1000}{\rho}$, by the head of metal required to maintain the required velocity of flow.

[60] Ingersoll and Zobel show, page 110, equation (132) that the temperature of a wall of thickness, b, at distance, x, inside the outer surface at time, t, after the inner face is heated by θ_0 degrees is

$$\theta=2\theta_0\left(\int_{\frac{b-x}{2h\sqrt{t}}}^{\frac{b+x}{2h\sqrt{t}}}e^{-\beta^2}\,d\beta+2\theta_0\,e^{(b+x)\frac{E}{K}+\frac{E^2}{K^2}h^2t}\left(1-\frac{2}{\sqrt{\pi}}\int_0^{\frac{b+x+2h^2\frac{E}{K}t}{2h\sqrt{t}}}e^{-\beta^2}\,d\beta\right)\right)$$

for small values of E and not too small values of b. E is the emissivity coefficient which may be about 0.0003 and h^2 is 0.0049, and $k=0.0037$.

The temperature of the outer face is found by setting $x=O$ in this equation. The equation then becomes

$$\theta=2\theta_0\,e^{b\frac{E}{K}+\frac{E^2}{K^2}h^2t}\left(1-\frac{2}{\sqrt{\pi}}\int_0^{\frac{b+2h^2\frac{E}{K}t}{2h\sqrt{t}}}e^{-\beta^2}\,d\beta\right)=2\theta_0\,e^{b\frac{0.0003}{0.0037}+\left(\frac{0.0003}{0.0037}\right)^2 0.0049\,t}\left(1-\frac{2}{\sqrt{\pi}}\int_0^{\frac{b+0.0098\frac{0.0003}{0.0037}t}{2\sqrt{0.0037\,t}}}e^{-\beta^2}\,d\beta\right)$$

or nearly

$$=2\theta_0\,e^{\frac{b}{12}+0.000034\,t}\left(1-\frac{2}{\sqrt{\pi}}\int_0^{\frac{b+0.0008\,t}{2\sqrt{0.0037\,t}}}e^{-\beta^2}\,d\beta\right)$$

which until t becomes fairly large or b very small is represented fairly well by the simpler form

$$2\theta_0\,e^{\frac{b}{12}}\left(1-\frac{2}{\sqrt{\pi}}\int_0^{\frac{b}{2\sqrt{0.0037\,t}}}e^{-\beta^2}\,d\beta\right)$$

which with slightly less accuracy is represented (t being small) by

$$-\frac{2}{\sqrt{\pi}}\int_0^{\frac{b}{2\sqrt{0.0037\,t}}}e^{-\beta^2}\,d\beta=1$$

since the upper limit of integration is ∞, by the equation $\theta=0$.

[61] Ingersoll and Zobel give an equation (91) on page 98 which can be converted into the following:

$$\theta=\frac{q}{\rho c\,2h\sqrt{\pi\,t}}\,e^{\frac{-x^2}{4h^2t}}$$

where q is the number of heat units suddenly liberated per unit area of a flat surface and θ is the temperature at distance, x, in time, t, thereafter. If the heat, q, be suddenly liberated at a point

$$\theta=q\,\frac{h^2}{k}\left(\frac{1}{2h\sqrt{\pi t}}\right)^3 e^{\frac{-r^2}{4h^2t}}$$

at distance, r, and time, t.

Publishes Symposium On Pearlitic Malleable

The American Society for Testing Materials has published the symposium on pearlitic malleable cast iron, presented at a meeting early this year under the sponsorship of the Cleveland district committee of the A.S.T.M., and the co-operation of the American Foundrymen's association. The symposium was assembled from material collected from various sources and contributed by individuals interested in pearlitic malleable iron.

The publication is divided into three sections, the introduction, producer's data, and patent information.

Copies of the symposium may be obtained from the A.S.T.M. headquarters, 260 South Broad street, Philadelphia, or through the American Foundrymen's association, 222 West Adams street, Chicago, for 60 cents each, or 10 copies for 45 cents each.

Connecticut Men Meet For Dinner, Golf

The annual meeting of the Connecticut Foundrymen's association was held at the Edgewood country club, Cromwell, Conn., June 19. Golf was scheduled for the afternoon and following a dinner in the evening, John Erler, metallurgist, Farrell-Birmingham Co., Ansonia, Conn., presented an interesting discussion on the subject of chilled iron.

A wet sheet and a flowing sea

The Adventures of BILL

By PAT DWYER

OCCASIONALLY while browsing through a work of fiction one comes across a passage dealing with the profound mental and emotional reactions of the hero when he inadvertently stumbles on the remains of a newspaper published at any time from six months to a year previously. The hero naturally is one of the great silent specimens who has gone into the hinterland to forget, or for some other silly reason which takes the author from 250 to 300 pages to explain—usually unsatisfactorily to any normal minded person above the age of ten.

Figuratively he falls on the old mildewed scrap of paper with teeth and claws and greedily absorbs the thrilling account of all the important events that have occurred since he took the high dive into the tall timbers. Hollywood Actress Faces Fate Worse Than Death, Salary, Reduced to $1000 Per Day! * * Man Claims Mate Bopped Him on Bean with Skillet (Inset blurred, picture of skillet) * * Modern Boy Philistine, Sets Fire To Cat's Tail * * G-Men Catch Another Rat * * * Young Socialite High Tails for Reno. **

Apparently incidentally, but in reality the high point to which the author craftily has been leading up to, the whiskery hermit finds a little paragraph tucked away in a corner stating that the villain fell out of a tree or something and in his dying statement freely confessed that he had stolen the cat's meat, or whatever it was, and for heaven's sake try to find Algernon (the hermit) and bring him back absolved from all stain.

I can understand the author's use of Trick No. 7 (See *The Story Writer's Guide*, Chap. VI) to shake Algernon awake and start him on the return journey, but I object to the volume of false enthusiasm he pumps into the incident of finding an old newspaper. You understand, of course there is nothing personal in this. For all I know—or care—to the contrary, the author may be an estimable character who never beat his mother and er—ah—all that jolly old kind of piffle. My objection is based on plain, ordinary common sense.

Consider the subject from your own point of view. Are you interested in reading old newspapers? Even one day old newspapers? Certainly not. Occasionally—it has been known to happen in the best regulated families—you pick a paper from the living room table, the porch swing or under the sewing machine and settle down for a quiet read. Such is the modern faculty for forgetting that you read it all the way through without recognizing items that you read a few days before. Suddenly your eye lights on the date and you blow up with a loud bang. The children rush off to their usual hidie-holes while their mother reads you a lecture on the proper use of words to be employed in the home.

Nevertheless the sting remains. You have been stung, or at least you think you have been stung and for several days thereafter you pick the evening paper up with ill concealed suspicion. You breathe on the glasses heavily and give them an extra polish with the corner of the old bandana. Then you glance sharply from the date on the paper to the calendar on the wall, before plunging bravely into the head lines. No one going to put any second hand tripe over on you a second time.

The bride learns something every day

Suppose you are walking peacefully down the street and a newspaper suddenly swoops around the corner and clings like a drowning man to one or both of your legs. Do you regard this as manifestation of divine providence, a singular favor vouchsafed you and you alone? Do you stoop eagerly, detach the sheet, hold it at arms length and devour every word on the page. You do, as Bill succinctly has pointed out under somewhat similar circumstances, in a pig's eye! To the vast and unconcealed amusement of the bystanders you stage a spirited not to say violent gymnastic exhibition in a more or less vain attempt to detach the loathsome object from your person. The children especially, bless their dear innocent little hearts, always enjoy these impromptu displays of good, clean fun.

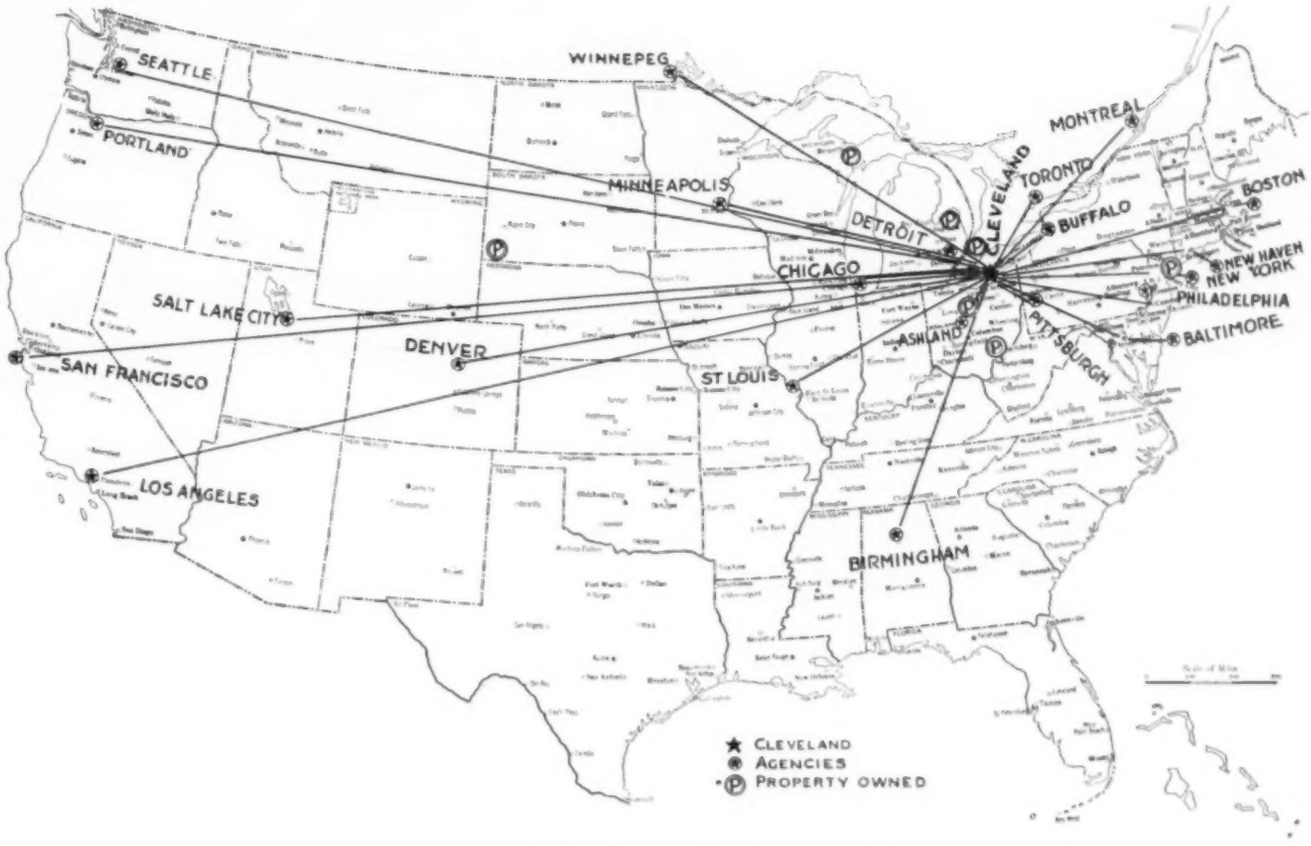
Taking the subject by and large, which is as good a way as any other if you are not in too great a hurry, I should say that the appeal of an old newspaper is slightly less than the appeal of the receipt for the fish slice you bought for the wife's girl friend's wedding back in 1904. You remember saying at the time that clumsy Eliza, the w.g.f. probably would cut herself if she ever attempted to use it and your wife told you to shut up. If you had your way you probably would carve the fish with a trowel or a double ender.

However, as I say, taking the subject by and large and if you are still with me, I am willing to admit that as with all or nearly all rules, an exception occasionally may be found to the rule that an old newspaper is the deadest and most useless of all created objects. To forestall any

(*Concluded on page* 54)

EVERYWHERE

A BUCKEYE SILICA FIRESTONE man is within calling distance



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Dover, O.		Seattle	

FOUNDRIES, STEEL MILLS, DROP FORGE and MALLEABLE PLANTS in all parts of this country and Canada from Massachusetts to California and from Georgia to Manitoba have adopted

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Hand Cut Cupola Blocks	Sawed 4 Sides	Sawed 6 Sides	Ground Stone (Firesand)
Sawed 2 Sides			for lining

Cupolas, Air Furnaces, Car Ladles, Drop Forge Bottoms, Mixers, Soaking Pits, Acid Tanks, Bessemer Converters.

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THE CLEVELAND QUARRIES COMPANY

CLEVELAND, OHIO

1886 · **Golden Jubilee** · 1936

Fifty years of continuous service in the Hardware Foundry, Steel, Paving and Construction field . . .

(*Concluded from page 52*)

weasely objections from the professional objector in the wrinkled brown pants and frayed pea bouncer I hasten to explain that I have no reference to the purely utilitarian aspects of the subject.

The present discussion is limited strictly to the printed word. That wonderful display of text and illustration known to the average citizen as nooze. Radio commentators and other exponents of the speech beautiful valiantly have tried for years to translate the word as enyous, but the great reading public still sticks stubbornly to the plain, common old ordinary nooze.

Coming right down to a concrete example, I picked up a paper the other day, and since it was still in the mailing wrapper I naturally assumed it was the current issue. The paper is a weekly, published in a small town in the East for which the lady of the house cherishes a sentimental interest. I penetrated as far as page three before I began to suspect dirty work at the cross roads. An item on this page announced that the Laurel Hill school had won the county school debating contest for its masterly presentation of the subject: Resolved that the traveler learns more than the reader.

East is East and West is West and though we live in between I am familiar in a general way with the fact that schools close for the summer at about the same time all over the country. A hurried glance at the date confirmed my suspicions. The paper was about two months old. I threw it in the waste paper basket. Later in discussing the incident with Bill I asked him how he would throw—not sell, mind you, but throw—how he would throw his vote if he was asked to give his opinion on the relative merits of reading or traveling as a means of soaking up knowledge.

"Well," said Bill." I'll tell you. There is a good deal to be said on both sides and I don't want to get tangled up in any argument, but if I was squeezed into a corner I should string along with the traveler. For one thing, a traveler has a chance to see and hear items that never have found their way into a printed page.

"For example consider that well known phenomenon, the Gulf Stream. Not long ago in the course of my travels I fell in with a lad named McCarthy who gave me some inside dope, that so far as I know never has been published. Dope, my dear lad that completely upsets accepted theories on the cause and performance of this great ocean current. Readers have read all about the Gulf Stream, but of what use is the information? Absolutely none.

"Diligent readers with fair to middling memories will tell you glibly that the Gulf Stream is caused by a combination of circumstances including the rotation of the earth and the prevailing or trade winds which drive a current against the continent of America. The big bulging hump on the upper left hand corner of South America divides the current and sends one branch streaming down along the coast of South America. The second division flows into the Caribbean Sea and Gulf of Mexico, takes a whirl around the coast and comes out into the Atlantic again through the Florida keys. Then it flows north to the grand banks of Newfoundland, turns eastward and gradually loses all force in the vicinity of the British Isles. Readers with practically no memories, know that the water in the Gulf Stream is much warmer than the waters on both sides. Practically all geographies direct attention to this phenomenon to account for the extremely mild climate in Ireland and the south of England. Other countries of the world in the same latitude are frozen stiff half of the year.

"Comrade McCarthy has no patience with people who either disseminate or gullibly swallow that kind of information. Seems to me he referred to it as baloney, sliced rather thin to be sure, but still baloney. As a plain matter of fact an ancestor of comrade McCarthy, at one time a king in Ireland, was responsible, not for the Gulf Stream, but for hot water in the Irish sea."

"They were great min in thim days," I admitted, "always out for a bit of diversion, stirring up hot water either by land or sea. History for the past few hundred years seems to indicate that it is by no means a lost art. If you ask my opinion, the comrade was having a bit of innocent fun at your expense."

"Old Benjamin Q. Scoffer, eh? Comrade McCarthy sells firebrick and is a man in whose integrity I have the greatest confidence. By a curious coincidence his voluminous research in the field of refractories brought him into contact with an ancient Irish professor whose twin hobbies are archeology, you know rooting around ruins, and tracing genealogical trees. This old bird freely confided the result of his investigations and comrade McCarthy passed the story along to me.

"The professor fixed the date at about 1500 B.C. when King McCarthy ruled in Ireland from Malin Head to Cape Clear and from Achill Head to Dublin Bay. Where the Curragh is now he built the greatest blast furnace in the world—."

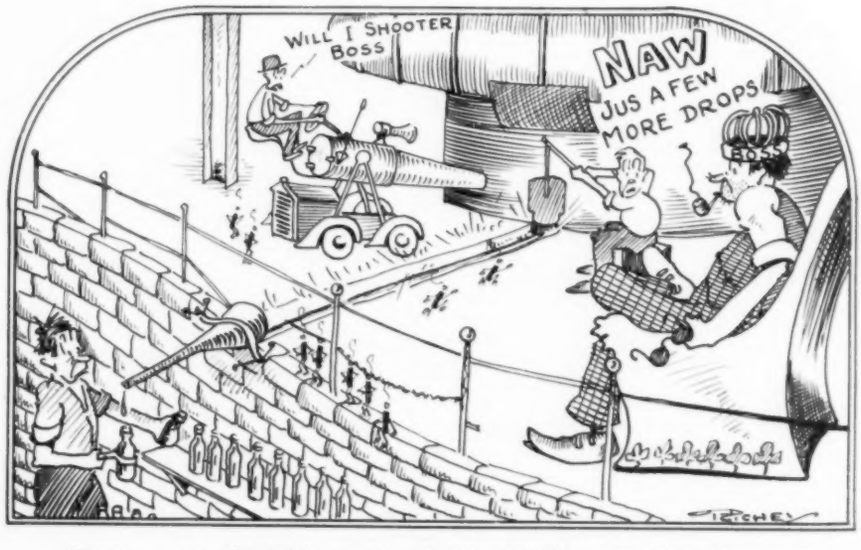
"A blast furnace in Ireland? That is news to me."

"Dozens of blast furnaces in Ireland at one time. You have heard of the round towers of Ireland? What do you suppose they were? Stoves, my boy. Hot blast stoves for the blast furnaces. This furnace on the Curragh was the biggest of 'em all and ran for several years on a government job, casting the pillars for the Giant's Causeway. This was a direct metal job in which the metal was poured into hexagonal ingot molds. When you recollect that 40,000 pillars or columns were cast before the accident—."

"You can cut the fairy story right there. Every one knows that these pillars are stone. I know dozens of people who actually have seen them."

"Did any of these dozens of people ever run a drill into any of 'em? I thought not. The pillars are iron. In the course of centuries the sea water has deposited a stone coating on the surface. However, that is neither here nor there. One night the furnace crew got staving drunk and in the resulting free for all fight they neglected their duties. The furnace broke out and an avalanche of fiery metal ran down into the sea. The water was raised to the boiling point and has remained warm down to this day—believe it or not!"

"My regards to comrade McCarthy." I said. "He's good, if you know what I mean."



From a rare old Irish print entitled "Tapping the Blast Furnace"

ADVERTISING PAGES REMOVED

Chill Is Released To Permit Contraction

THE CROSS section of a pulverizer casting on which the indicated area is to be chilled is shown in Fig. 2. The casting is 50 inches outside diameter, 40 inches inside diameter with a fairly uniform metal thickness bottom and sides of 5 inches.

Since this ring is to be chilled on the inner face it is apparent that the chill must be constructed in a manner that will allow it to be released and thus facilitate the contraction of the casting. Experience has shown that a circular chill cut in two or three sections will warp out of shape the first time it is used and will not form a true circle when used on subsequent castings. For that reason it is advisable to form the chill in many sections as shown in Fig. 1. In the present instance 12 sections approximately 10 inches long on the face will serve satisfactorily. Ten of these will be cut on radial lines, while two will be cut with the taper in the opposite direction. These two form the keys, to be extracted immediately after the casting has set.

Extracted by Two Methods

Two methods are available for extracting the keys. In the first the two opposing keys are connected by turnbuckles. After the casting has set, the sand is removed through the upper opening in the casting to expose the center of the turnbuckle. A wrench or a steel bar with a bent end is employed to twist the turnbuckle. It is only necessary to pull the keys back a short distance.

In the second method the key sections are tapered as shown at *A*, that is from top to bottom as well as from end to end. A steel loop is set in the top side near the inner end. After the casting has set the flask is rolled over, the bottom plate and some of the sand removed and the steel loops exposed. The crane is hooked to the key sections and they are lifted out.

These same loops may be utilized in setting the chill sections in the pattern before the flask is filled with sand in the event that this method is preferred to setting the chills in the mold after the pattern has been removed. The first method may not be practical if the mold is jolted on a machine without sufficient capacity to lift the weight of the combined drag and chills. It is the most convenient method to employ where the machine is strong enough, or, where the mold is rammed by hand. However, if this method is employed, a loose pattern ring in segments will be required for the part under the overhang of the chills. In the second method a print will be needed on the pattern for the reception of the chills.

A thickness of approximately 6 inches will be needed in the chills, which means that each section will weigh over 100 pounds. If the mold is made in dry sand, the 6-inch print will support the weight, but if the mold is made in green sand, suitable reinforcement will be needed in the print to support the weight.

Faces Are Not Machined

Where the chill sections are cast to reasonably accurate size, it will not be necessary to machine the adjoining faces. After the entire set is in place the joints are daubed with a putty like mixture of oil and blacking to prevent the formation of fins. Needless to say the chill sections must be thoroughly free from moisture or rust.

In the event that the chill sections are placed in the mold after the pattern is removed, a drilled and tapped hole will be required on the top side for the insertion of the end of a lifting bolt provided with an eye at the other end. This hole later may be filled with sand, a short piece of stock core, or a short piece of steel rod. If the rod is used, the end is daubed over with blacking to prevent the formation of a fin that would interfere later with the extraction of the rod.

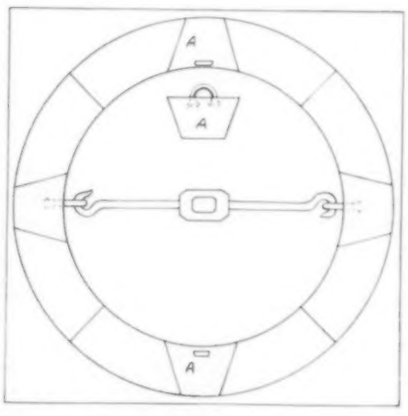


Fig. 1—Key chill sections may be pulled in by turnbuckle, or lifted by crane as at A

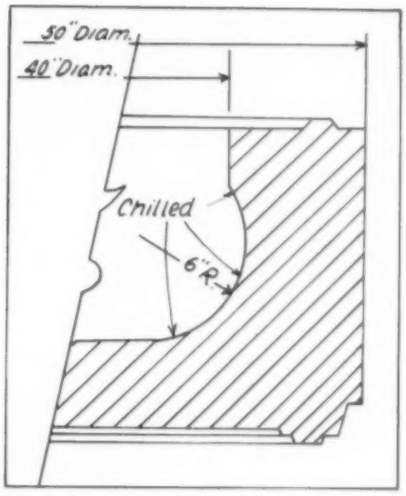


Fig. 2—Casting is chilled on inside face

Elects Officers Of Connecticut Group

At the 197th meeting of the Connecticut Foundrymen's association, held at the Edgewood Country club, Cromwell, Conn., June 19, the following officers were elected for the year 1936-37: President, William J. Maton, foundry superintendent, Waterbury Farrel Foundry & Machine Co., Waterbury, Conn.; vice president, B. W. Spencer, Connecticut Foundry Co., Rocky Hill, Conn.; secretary, N. J. Stringer, foundry manager, Charles Parker Co., Meriden, Conn.; treasurer, G. R. Holmes, vice president, McLagon Foundry Co., New Haven, Conn.

The election of the board of directors is as follows: C. S. Neumann, president, Union Mfg. Co., New Britain, Conn.; Charles S. Parker, president, Charles Parker Co., Meriden, Conn.; J. J. Toth, works manager, Atwood Machine Co., Stonington, Conn.; E. B. Spencer, treasurer, Philbrick-Booth & Spencer Co., Hartford, Conn.; H. S. Washburn, president, Plainville Castings Co., Plainville, Conn.

Golf preceded the dinner, at which twenty-seven members were present. J. Erler, metallurgist, Farrel Birmingham Co. Inc., Ansonia, Conn., talked and discussion followed on the making of chilled iron castings.

Banquet Address Printed

The American Foundrymen's association, 222 West Adams street, Chicago, has printed the address of W. J. Cameron, Ford Motor Co., Detroit, which was presented before the association's annual banquet, May 7, at the Book-Cadillac hotel, Detroit.

Reader's Comment

EDITOR'S NOTE—*Material Appearing Under this Head Does Not Necessarily Reflect the Opinion of* THE FOUNDRY *or of Its Editors.*

Material Prices Show Marked Advance

TO THE EDITORS:

We enclose a list, a copy of which was sent to all our customers, showing comparative costs on raw materials used in the production of Gray Iron Castings. This list covers the period from June 1, 1933 to June, 1936.

It is our belief that in many instances foundry management is not aware of the tremendous increases in raw material costs or the knowledge is ignored. On all the reports we have seen showing "Trend of Prices in Gray Iron Castings" the answer is "no change."

You will note that the cost of pig iron, the most important raw material, has advanced 59.3 per cent up to this time, and there is a strong possibility of another advance for fourth quarter requirements.

It is difficult, naturally, for a few scattered foundries to increase prices when there is no united action among the majority.

From the accompanying list it is obvious that an increase in price is not only justifiable, but necessary.

Probably one of the greatest services you could render the gray iron industry today would be to drive home, not only to foundrymen, but to users of castings as well, the fact that costs have increased and prices should be increased accordingly.

R. HOLTON CONFER

Confer, Smith & Company Inc.
Hamburg, Pa.

Comparisons presented by Mr. Confer are as follows:

		Per Cent Increase
Pig Iron		
June 23, 1933	$13.84 Gross Ton	
June 17, 1936	22.06 Gross Ton	59.3
No. 1 Textile Scrap		
July 22, 1933	$11.64 Gross Ton	
July 8, 1936	14.95 Gross Ton	28.4
Aluminum Scrap		
June, 1933	$0.07 Pound	
June, 1936	0.15 Pound	114.28
Aluminum Alloy		
June, 1933	$0.14 Pound	
June, 1936	0.185 Pound	32.14
Coke		
June 8, 1933	$6.34 Net Ton	
June 11, 1936	9.84 Net Ton	55.2
Molding Sand		
June 28, 1933	$2.98 Net Ton	
May 28, 1936	4.40 Net Ton*	47.6
Core Sand		
June 1, 1933	$3.88 Net Ton	
April 13, 1936	3.12 Net Ton*	19.5
Core Oil		
1933	$0.44 Per Gallon	
1936	0.58 Per Gallon†	31.8
Fire Clay		
1933	$20.00 Net Ton	
1936	25.00 Net Ton	25.0
Flask Lumber		
1933	$45.00 Per 1000 Feet	
1934	60.00 Per 1000 Feet	33.3

*Price of sand advanced 10 cents per ton with reduction on freight rate.

†Linseed oil, which is the base for core oil, advanced six points on July 6 and is still advancing. This naturally increases the cost on all cored castings.

Molding wages have advanced over 1933 rate 14.7.

Trucking rates to delivery point have advanced 13.3.

Under the Social Security Act our pay rolls are being taxed 1 per cent as of Jan. 1, 1936, and effective Jan. 1, 1937, will be increased 2½ per cent.

Stone Lining

TO THE EDITORS:

Under Reader's Comment in the March issue of THE FOUNDRY, a letter was published signed by a Mr. Bales of Ironton, O., in which it was asserted that the use of stone in lining cupolas resulted in reduction of silicon hard spots in the iron.

This contention, which bobs up perennially in spite of the increasing use of stone, was again completely refuted at the refractories session of the A. F. A. convention in Detroit. I do not believe any further comment is necessary except to say the statement made was not proved.

E. A. BURR,
Secretary.

Cleveland Quarries Co.
Cleveland.

Trained Men Needed

TO THE EDITORS:

Our corporation recently was called on to make some heavy castings for an Eastern pump concern which operates its own foundries, but was unable to find capacity for its increasing business. About the time we received their patterns we also began to get large orders for our own work. Every available molder in and around our small community is now employed. The same is true in larger centers in a radius of 100 miles. Within this area it is impossible to get molders or coremakers to handle this additional work.

As superintendent of this plant, the situation is of prime interest. No one here ever dreamed that the supply of molders would vanish like snow off a fence and naturally none have been trained. We now have had the large customer's patterns for about 3 weeks and have not been able to make one casting for them. It seems to me that the shortage of help should be considered by those who sell our output and greater leeway given in delivery dates.

GRAY IRON SUPERINTENDENT.

Gives Experience

TO THE EDITORS:

I was interested in reading a question and answer appearing in the April issue of THE FOUNDRY, and also a letter in the June issue relative to obtaining satisfactory physical properties for *G* metal (88 per cent copper, 10 per cent tin, 2 per cent zinc) to meet government specifications.

If this metal is melted in plumbago crucibles in natural draft pit fires and charcoal is used as a cover and it subsequently is deoxidized with two ounces of 15 per cent phosphor copper before pouring, then the results will be along the line of:

Tensile Strength, 35,000 pounds per square inch.

Yield Point, 20,000 pounds per square inch.

Elongation, 15 per cent.

There is published data showing that this alloy, if cast at 2050 degrees Fahr., will have a tensile strength of 40,000 pounds per square inch.

The fractures of the test bars which we made in connection with this charcoal covered metal were unsatisfactory in that they were coarsely crystalline and discolored. The test bar was the standard keel block pattern, which provides for ample feeding.

We found that, by discarding the charcoal and substituting a flux consisting of crushed ordinary bottle glass, 6 parts by weight, and soda ash, 1 part by weight, (mixed well before added), and continuing the use of 2 ounces of phosphor copper per 100 pounds, and pouring at 1900 degrees Fahr., that the following results were obtainable:

Tensile Strength, 42,450 pounds per square inch.

Yield Point, 20,225 pounds per square inch.

Elongation, 30 per cent.

This fracture was of a fine crystalline nature, golden in color.

In regard to the addition of nickel to this alloy, we found that, by using 50-50 nickel copper shot and placing it in the bottom of the crucible with the balance of the charge on top, there is no difficulty in getting it incorporated into the alloy in a satisfactory manner.

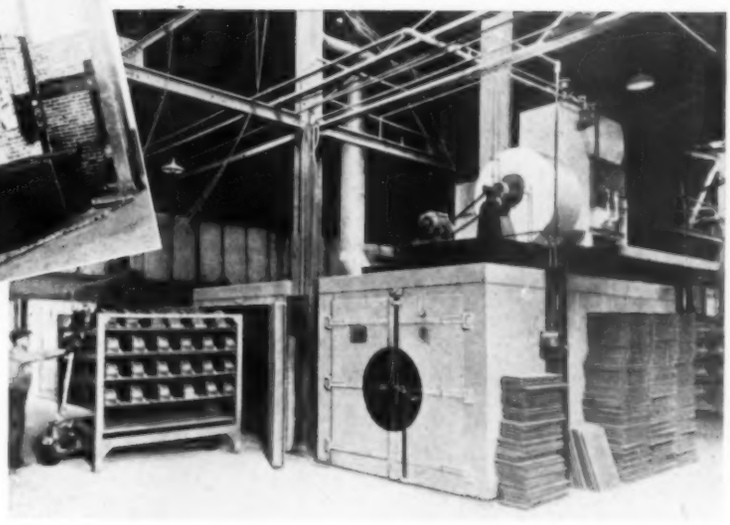
We trust that our experience, as outlined in the foregoing, may be helpful in the solving of the problem in the foundry in question.

A. C. BOAK

Canadian Bronze Co. Ltd.
Montreal, Canada

Coleman "Transrack" Core Ovens

Coleman "Transrack" Ovens. Direct Coke Fired.



Coleman "Transrack" Ovens. Gas-Fired External Recirculating Heating Systems.

THE Coleman "Transrack" system of core oven operation offers many important advantages. Core-makers load their work directly onto portable racks which are transported when loaded to the ovens. The quick replacement of a finished rack of cores with a "green" rack-load provides extremely efficient utilization of the oven capacity.

Coleman "Transrack" Core Ovens are in successful use in hundreds of foundries, from the largest production shops to the small jobbing and specialty foundries.

Good castings demand good cores! Coleman controlled heating systems eliminate guess work in core baking. Perfectly baked cores at lowest cost for fuel and labor!

It will pay you to investigate the Economies of Coleman Ovens for your Core department.

Coleman Ovens are a product of thirty years' specialization in core baking and mold drying. Over 4000 COLEMAN OVENS in successful operation in leading foundries everywhere.

BUILT IN ALL TYPES AND SIZES—
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FOR OPERATION WITH ANY FUEL—
Gas, Oil, Coke, Stoker-coal, Powdered-coal, etc. Direct-fired and external recirculating heating systems.

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The FOUNDRY EQUIPMENT Co.

BUILDERS OF COLEMAN AND SWARTWOUT OVENS
CONTRACTING ENGINEERS AND MANUFACTURERS

C L E V E L A N D • O H I O

Gray Cast Iron (*Chapter XI*)

(*Concluded from page* 33)

the foundryman defines both the running and feeding qualities of the metal. In correct scientific terminology the term fluidity indicates the converse of the term viscosity.

Fluidity test strips often are used by foundrymen to determine the running qualities or fluidity of the metal. The assembly drawing of the pattern for the fluidity strip or spiral used by Saeger and Krynitsky—*Transactions*, American Foundrymen's Association, 1931—is shown in Fig. 120. The metal is poured into the pouring basin (4) whence it travels through the down-gate (3) through the horn gate (2) and from there into the outer end of the spiral (A-1). The total length of the spiral is 60 inches.

The distance, in inches, through which or to which the metal flows before freezing is a measure of the relative fluidity of the metal, or the running quality. A number of factors affect fluidity, including the true fluidity (converse of viscosity) of the metal itself, the pouring temperature and the nature and condition of the mold.

In general the fluidity of an iron increases as the composition approaches the eutectic. In other words the viscosity increases as the iron is lower in carbon and silicon. Berger—*Bulletin Official* du Syndicat General des Fondeurs de Belgique, No. 17, August 1932—showed that the fluidity increases lineally to within a few tenths per cent of the eutectic and then drops sharply away above it. Since hypereutectic irons are uncommonly met, and are not very good from an engineering viewpoint, there is shown in Fig. 121 the earlier chart by Spencer—*Transactions*, American Foundrymen's Association, 1931—which shows the practical effect of percentage of carbon plus 0.3 per cent of the silicon on fluidity.

Obviously, a given iron poured into a given mold will flow further if poured hot than if poured cold. Or of two irons poured at a given temperature, that which has the lower freezing range should flow further, as it has a greater temperature interval within which it remains liquid. Likewise the greater the conductivity of the mold the more quickly a given iron poured at given temperature will freeze.

Saeger and Krynitsky, in the condition of their experiments found that the spiral cast in dry sand molds were longer than the corresponding spirals cast in green sand molds. This and the effect of pouring temperature is nicely shown in Fig. 122.

There are many other factors involved in precise study of the fluidity or running qualities of gray irons. A number of these are mentioned here and there in the text. In the 1933 A. F. A. A. S. T. M. *Symposium on Cast Irons*, it is suggested that relative fluidity is proportional to the formula:

$$\text{Fluidity} = \frac{P - F}{F - M}$$

where P is the pouring temperature; F is the freezing point of the iron, and M is the mold temperature.

New England Men Visit Plants, Hear Talks

Members of the New England Foundrymen's association attended the opening of the plant of the Mystic Iron Works, Everett, Mass., June 10. A buffet luncheon was served at noon, following which the first heat was taken at 1:30. A complete inspection of the works as well as the various phases and processes of making pig iron was made by the group. Additional arrangements were made for a visit to the Warren Foundry & Pipe Corp., Everett, and an inspection of the New England Coke Co., located in the same vicinity.

Transportation was provided to the Engineer's club, Boston, for the regular evening meeting and dinner. Norman F. Tisdale, Molybdenum Corp. of America, Pittsburgh, principal speaker of the evening, talked on "Applications of Molybdenum to Cast Iron." He described numerous places where molybdenum is of decided advantage as well as the general effects of molybdenum on the physical properties of cast iron.

Iron, Steel Alloys Discussed in Circular

The production, heat treatment and properties of iron and steel alloys are discussed in a recent circular of the United States department of commerce, bureau of standards, Washington. Prepared in response to continuing requests for a reasonably brief statement of the principles concerning the heat treatment of steels, and for a similarly simplified statement covering the production and properties of iron alloys in general, the booklet presents some of the early types of iron alloys, describes briefly the reduction of iron ore, the production and properties of cast irons, and discusses the equipment used in heat treatment processes. Micrographs and diagrams point out essential features of structure, decomposition, quenching, chemical composition, etc., of the various alloys. The booklet is obtainable from the superintendent of documents, Washington, for 10 cents.

Booklet Discusses Collective Co-operation

American Iron and Steel institute, 350 Fifth avenue, New York, has published an interesting and highly instructive booklet entitled, "The Men Who Make Steel." It is intended for the setting forth of some of the salient facts regarding the principles and practices of collective co-operation.

The use of steel in daily life, collective bargaining, steel wages and hours, the problem of safety as handled by the steel mills, employes' welfare and the necessity of steel operating on a large scale basis are some of the subjects discussed and thoroughly analyzed. Figures are used extensively to emphatically substantiate statements made in regard to these topics.

A. F. A. Publishes Safety, Hygiene Reports

Progress in the engineering, medical and legislative aspects of safety and hygiene in the foundry, as presented in reports and papers before the Detroit convention on May 8, has been recorded in a recent booklet of American Foundrymen's association, 222 West Adams street, Chicago. The booklet contains the report of the committee on industrial hygiene codes, an address covering the medical aspects of safety and hygiene by Roy R. Jones, medical advisor, division of labor standards, Washington, a discussion of the legislative aspects by Voyta Wrabetz, chairman, Industrial Commission of Wisconsin, Madison, Wis., and excerpts from the general discussion during which J. A. Britton, International Harvester Co., Chicago, acted as forum leader. The address entitled, "House Cleaning Time in the Foundry," by E. O. Jones, director of safety and hygiene section, A. F. A., and presented before the All-Ohio Safety congress, also is included.

Move to Cleveland

Steel Founders' Society of America will remove its headquarters from the Graybar building, New York, to room 920 Midland building, Cleveland, on Aug. 15. There will be no change in the executive and administrative personnel of the organization.

ADVERTISING PAGES REMOVED

Malleable Society Meets at Hot Springs

At the opening of a two-day session of the Malleable Founders' society which convened at Hot Springs, Va., June 18, the election of directors by the three sections of the Society was announced. These officers are as follows:

WESTERN SECTION: R. R. Fauntleroy, president, Moline Malleable Iron Co., St. Charles, Ill.; C. S. Anderson, president, Belle City Malleable Iron Co., Racine, Wis.; W. V. Tiscornia, vice president, Auto Specialties Mfg. Co., St. Joseph, Mich.; Brinton Welser, vice president, Chain Belt Co., Milwaukee.

CENTRAL SECTION: R. N. Cole, president, Canton Malleable Iron Co., Canton, Ohio; C. C. Gibbs, president, National Malleable & Steel Castings Co., Cleveland; John C. Haswell, president, Dayton Malleable Iron Co., Dayton, Ohio; A. F. Jackson, vice president, Michigan Malleable Iron Co., Detroit.

EASTERN SECTION: L. A. Dibble, president, Eastern Malleable Iron Co., Naugatuck, Conn.; F. O. Parker, sales manager, Acme Steel & Malleable Iron Works, Buffalo; Frank E. Shumann, president, Lehigh Foundries Inc., Easton, Pa.; H. L. Steeves, vice president, Rhode Island Malleable Iron Works, Hillsgrove, R. I.

The session covered reports of the society's officers, a resume of activities and a study of the spread of rates and hours in the period 1933-36 with the attendant effect on cost. This study was prepared by Robert E. Belt, secretary.

At the annual dinner, Prof. H. H. Maynard, Ohio State university, Columbus, O., addressed members of the society on the subject "Can American Business Govern Itself?" Various topics relating to study of uses, research and development work were discussed at the concluding session, Friday morning, June 19.

Society Stresses Quality of Castings

Gray Iron Founders' society, Public Square building, Cleveland, has undertaken to acquaint its members, who constitute the more forward looking element of the industry, with the many developments which have taken place with reference to cast metal. The society has completed the distribution of the latest A.S.T.M. specifications affecting gray iron. It has also undertaken to inform the engineering and purchasing public with the value of using the specifications in selecting the quality of gray iron adaptable to the particular need.

The society has prepared a directory of its members for use by users of gray iron castings. The technical committee in charge of these activities consists of the following: Chairman, J. D. Coltman, Bullard Machine Tool Co., Bridgeport, Conn.; J. H. Bruce, Bowler Foundry Co., Cleveland; C. R. Culling, Carondelet Foundry Co., St. Louis; William J. Grede, Liberty Foundry Inc., Wauwatosa, Wis.; LeRoy M. Sherwin, Brown & Sharpe Mfg. Co., Providence, R. I.; and A. C. Denison, Fulton Foundry & Machine Co., Cleveland.

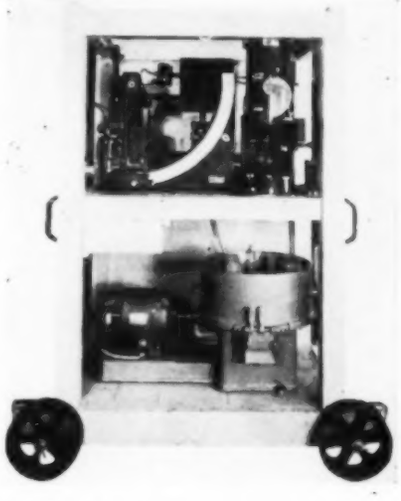
Equips Portable Sand Testing Laboratory

Illinois Clay Products Co., Joliet, Ill., recently placed into service one of the most complete portable sand testing laboratories yet devised. Measuring only 6 x 6 x 3 feet, it is equipped with demountable steel wheels, skids and a protective shipping case. The shipping weight is only 1500 pounds.

The equipment consists of a muller type laboratory mixer; a standard A. F.A. rammer; a modern mercury seal permeability apparatus; a motor driven universal sand strength machine; a quick moisture device, electrically heated; and two pan balances, with weights.

The moisture device is equipped with a 2-inch pan to permit the quick baking of standard sand specimens for dry strength determination. On the rear panel is mounted the transformer, switches and complete connections for plugging into various types of current.

The unit is used by the foundry engineering staff of the Illinois company in demonstrating bond clays and in establishing synthetic sand and sand control programs in gray iron, malleable and steel foundries.



The equipment consists of a sand muller and standard testing equipment

St. Louis Chapter Elects New Officers

St. Louis Chapter of the American Foundrymen's association recently elected the following officers: Chairman, George Mitsch, American Car & Foundry Co.; vice chairman, G. S. Haley, Century Foundry; secretary-treasurer, John W. Kelin, Federated Metals Corp. Directors for one year: F. O'Hara, Central Brass & Aluminum Foundry Co., T. Hamlin, United States Radiator Corp., W. L. Kammerer, Midvale Mining & Mfg. Co. and R. Stifel, Hickman-Williams Co. Directors for two years: J. Hives, Sterling Steel Castings Co., H. Goodwin, Medart Co., R. Durkin, H. W. Warren Coke Co. and E. A. Goerger, St. Louis Pattern & Model Works. Directors for three years: R. Hill, East St. Louis Casting Co., J. Klein, Southern Malleable Iron Co., M. A. Bell, M. A. Bell Co., and L. Desparois, Pickands-Mather Co.

D. M. Curry, International Nickel Co., New York, was principal speaker at that meeting, presenting an interesting and informative talk on the use of nickel in brass, bronze and kindred alloys. Mr. Hamlin summarized the chapter's affairs for the past year, Mr. Kammerer reviewed the various exhibits displayed at the Detroit convention and Mr. Haley gave a brief talk on "The Outlook for Better Times in the Coming Year."

Book Review

An Introduction to the Metallurgy of Iron and Steel, by H. M. Boylston, cloth, 563 pages, published by John Wiley & Son Inc., New York, and supplied by THE FOUNDRY, Cleveland, for $5 plus 15 cents postage, and in Europe by the Penton Publishing Co. Ltd., London.

This is the second edition of a valuable work written primarily for students in engineering schools and evening schools, and first published in 1927. Additional information has been added and statistical data have been corrected in the present edition.

The scope of the discussion can be best understood by considering the various chapter headings which follow: Historical and Economic Background of the Iron and Steel Industry; Chemical and Physical Principles; Raw Materials of the Iron Industry; Blast Furnace and the Manufacture of Pig Iron; the Foundry; Wrought Iron; Early Steelmaking Processes; the Bessemer Process; Open Hearth Process; Electric Furnace Process; Manufacture of Commercially Pure Iron; Ingot Making; Mechanical Treatment of Steel; Combination, Structure and Physical Properties of Iron and Steel; and the Heat Treatment of Steel.

The appendix includes the A. S. T. M. standard definitions of terms relating to heat treatment operations.

Wisconsin Chapter Holds Annual Outing

Milwaukee Chapter of the American Foundrymen's association held its annual summer outing at Westmoor country club July 17. A silver cup was given to Edward Roth, Motor Castings Co., Milwaukee, for winning low gross for the day's golf among operating foundrymen.

Low gross for nonoperating foundrymen was won by R. C. Smith, J. I. Case Co., Racine, Wis., and R. Arneson, Arneson Foundry Co., Kenosha, Wis. Carl Miller, Universal Foundry Co., Oshkosh, Wis., had the longest drive on the first hole. R. Hart, Wisconsin Steel Co., Chicago, was closest to the flag on the third hole. C. D. Hollins, National Engineering Co., Chicago, had the highest total score, B. F. McIntyre, Macklin Co., Jackson, Mich., had the lowest number of putts and William McNeil, Federal Malleable Co., West Allis, Wis., had low net.

Prizes were given for these events at the dinner which featured a floor show.

Book Review

Transactions of the American Institute of Mining and Metallurgical Engineers, 1935, 418 pages, 6 x 9½, published by the Institute of Metals division, 29 West Thirty-ninth street, New York, and supplied by THE FOUNDRY, Cleveland, for $5.00 plus 15 cents postage, and in Europe by the Penton Publishing Co. Ltd., Caxton House, Westminster, England.

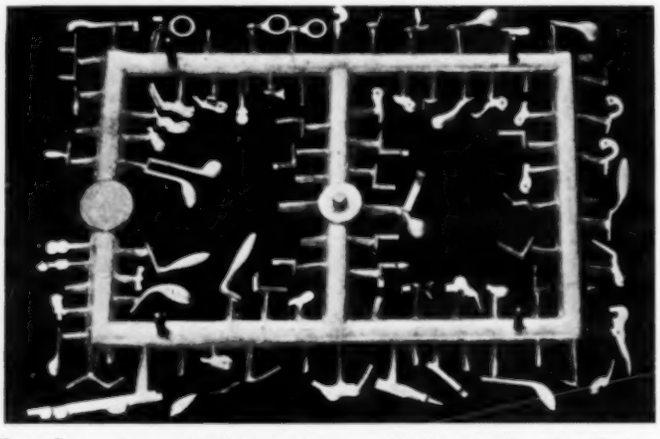
This volume is the ninth of a series constituting the official proceedings of the Institute. It deals with nonferrous metals and includes papers presented at the New York meeting, Oct. 2-4, 1935, the New York meeting, Feb. 18-21 and the Chicago meeting, Oct. 1-3, 1935. The annual lecture presented by Dr. C. A. Edwards on "Gases in Metals" as one of the features of the program in New York in February, is also included. After a preliminary introduction, this paper presents general observations on the sensitivity of metals to gases, their behavior when subjected, and the relation of hydrogen to absolutely pure iron. The remainder of the discussion is devoted to eight salient divisions: Defects developed by the diffusion of hydrogen in metals; influence of temperature and pressure upon the solubility of gases in metals; influence of mass upon rate of cooling; removal of gas by physical means; steel ingots; effects of mass; and oxygen content.

Following this presentation, other interesting subjects are discussed, including studies of the copper-silver system, crystallographic uniformity of lineage structure in copper single crystals, influence of lattice distortion on diffusion in metals, quenching stresses and precipitation reaction in aluminum-manganese alloys, a study of the molybdenum-carbon system, , thermal and electrical conductivities of copper alloys, and properties of the platinum metals.

Points to Dangers Of Power Concentration

"Planned Economy" is a disarming title for the Walsh bill, according to a vigorous discussion recently published by the Farrel-Birmingham Co., Ansonia, Conn. Terming it as another attempt to enforce regimentation of labor and business, the article, written by Allen W. Rucker and N. W. Pickering, states that the scheme would make the secretary of labor virtual dictator of American business and lead to a restoration of the N.R.A.

The bill, according to the authors, would place in the hands of the secretary of labor absolute power to control wages and hours not only of those who directly sell the government but also of those who supply materials and supplies used by the principal contractors. It also provides for the power to investigate and examine industry at will, to hold hearings and determine findings conclusive on all buying departments of the government.



Nickel silver keys for a clarinet cast on a single gate by the C. G. Conn Co., Elkhart, Ind. Illustration courtesy International Nickel Co.

Detroit Chapter Elects Officers for 1937

The following officers of the Detroit Chapter of the American Foundrymen's association were elected at a meeting held June 18 at the Glen Oaks golf club, Detroit: Leslie G. Korte, Atlas Foundry Co., Detroit, chairman; R. Blair Crawford, Atlas Foundry Co., vice chairman; Harry J. Deutsch, Aluminum Co. of America, secretary; Frank X. Mushynski, American Car & Foundry Co., treasurer; and Jesse D. Stoddard, Detroit Testing Laboratory, representative to A. F. A.

The executive board consists of the following: R. Blair Crawford; Harry W. Dietert, Harry W. Dietert Co., Detroit; Ira F. Cheney, Griffin Wheel Co., Detroit; Hugh Martin, Detroit Gray Iron Foundry, Detroit; Dan H. Meloche, American Radiator Co., Detroit; and Vaughn Reid, City Pattern Works, past president of the chapter.

Detroit chapter held its summer golf meeting at the Grosse Isle country club, July 16. Hugh Martin was in charge of arrangements for the affair. A dinner was served following the afternoon of golf, at which prizes were distributed to winners of the tournament.

Symposium on Fuels

The American Society for Testing Materials, 260 South Broad street, Philadelphia, recently published a symposium on industrial fuels comprised of four extensive technical papers as follows: Coal and coke; industrial fuel oils; manufactured gas; and liquefied petroleum gas.

Among subjects covered are historical background, magnitude of the industry, future availability of raw materials and general economic aspects of the product and utilization. Copies may be purchased from the society.

Holds Summer Outing

A summer outing was held by the Connecticut Foundrymen's association July 18 at The Sheriff's, Haddam, Conn. Noon luncheon was served followed by games and other forms of entertainment and a dinner in the evening. George Holmes, McLagon Foundry Co., New Haven, Conn., was in charge of reservations.

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Type RES
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Rollover Draw
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The entire machine is
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The mold is squeezed and clamped *BEFORE* being rolled over, consequently the flask cannot drop away from the pattern plate.

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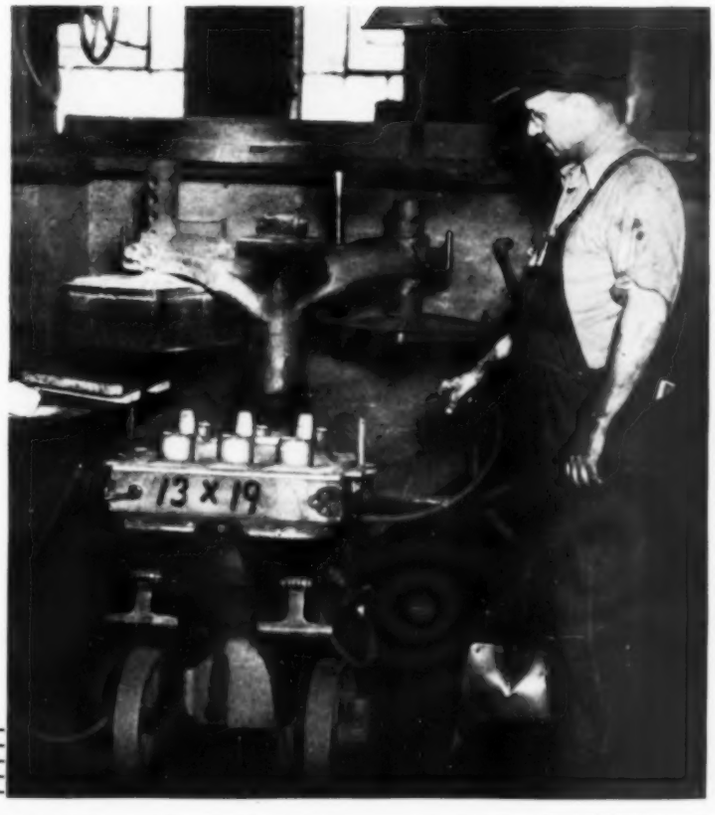


Pot Casting Swept Up in Loam

(*Concluded from page* 24)

the load was lifted and placed on the stands shown in Fig. 6. Here the surface was finished and black washed. Several salamanders were placed on the floor on the inside, filled with coke and fired until the mold was dried.

The thickness of sand was removed from the inside or cone shaped part of the mold remaining in the pit. Loose pattern parts also were removed and the surface was black washed as shown in Fig. 2. Salamanders filled with coke were placed around this part of the mold and a loose shelter of sheets built to confine the heat. Later the various cores were placed in position. The cores in the large interior pockets were supported on chaplets. The vent escaped through the prints shown as black rectangles on the white paper in Fig. 5. A curbing was erected around the loam part of the mold and projected about a foot above the floor level as shown in Fig. 7.

Method of binding the mold securely together is shown in the same illustration. The first binder bars rested on top of the cope and on stanchions built up from the second circular plate shown in Fig. 6. Two transverse binders on top of the first two were connected by slings and turnbuckles to the bottom or foundation plate. A longer binder bar on top of the second pair was connected in a similar manner. This arrangement provided six equally spaced positive points of connection between the top and the bottom of the mold.

Cupola metal containing 10 per cent steel and poured from two ladles on opposite sides of the mold conformed to the following approximate analysis: Silicon 2.00 per cent, sulphur 0.10 per cent, manganese 0.60 per cent, phosphorus 0.45 per cent.

Northeastern Ohio Group Holds First Outing

Members of the Northeastern Ohio Chapter of the American Foundrymen's association held their annual outing, at Lake Forest country club, Hudson, O.

J. C. Fluck, in the afternoon golf tournament, had low gross with an 80, J. H. Keating was runner up with an 84 and W. D. Bennet took third place with an 85. Ward Martin captured low net with 92-25-67, E. C. Zirzow had 118-50-68 for the runner up position and M. Raymond took third with 88-19-69. Blind bogey resulted in tie between five men: F. Daymon had 108-35-73, H. A. Baker, 108-35-73, F. W. Munipfer, 88-15-73, H. Sellers, 96-23-73 and C. E. O'Brien, 93-20-73. High score for the day was made by Ben Lambert with 86-66-152 and A. D. Smith gathered up the most strokes on one hole, taking 14 on No. 8. Low gross on the first nine went to E. J. Stack with 43, F. W. Munipfer with 44 and M. G. Thomas with 42. Robert Fisher had the most sixes and A. E. Abbot the most sevens.

A dinner in the evening climaxed the day's activities at which prizes were awarded.

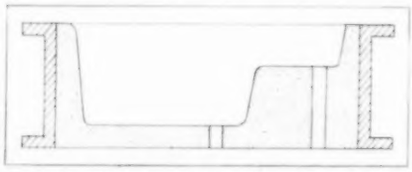


Fig. 9—Step in runner basin prevented metal from entering upper sprue until the mold was partly filled with metal

Defects Caused By Improper Gates

(*Concluded from page* 26)

all instances, and also reducing trouble from one of the many causes of defects, namely, sucking air in with the flowing metal. If after watching the flow of the metal through the gate provided, it is found that there is agitation caused by this jet effect, the correction is obvious. Arrange the gating so that there is a proper choking at the right point to standardize the flow through the gates leading to the castings. Either reduce the sprue size, or arrange to have a sufficient number of gates to absorb the entire flow through the given sprue without agitation.

If one will remember the varying effect produced upon the flow of the water through the nozzle by varying positions of the adjustable nozzle on a conventional hose, it is easy to see how the change of gating can change the flow of metal into the mold. There are foundrymen who will consider this only a very minor cause for defects. However, the experience of many indicates that this is a major cause for many troubles that have been laid at the door of some other foundry practice and, therefore, the correction has not been as successful as might be expected.

All foundrymen are interested in the production of sound castings, as well as clean castings. Those manufacturing castings for sale are even more vitally interested in the quality of the castings because of the difficulty of getting repeat orders when the product is not uniformly reliable. Therefore, every precaution must be taken to prevent defects of any kind.

The nozzle or spray effect of an improper gate is causing many castings to be rejected and all too frequently the cause of the defects is not recognized. Dirt inclusions are considered to be caused by bad molding or improper condition of sand, etc., when in reality the dirt was eroded from the mold or from the gate by the spray effect described. Slag spots often are thought to be the result of improper skimming of the metal before pouring, when as a matter of fact the slag was produced after the metal had been poured into the mold by the spray effect of a badly designed gate.

Advertising and The Jobbing Foundry

(*Concluded from page* 29)

stockholding connections with your competitors. Perhaps they did. But advertising did not know that.

Advertising stalks its quarry month after month. Advertising is a slow dog whose master is the man who is in business to stay. Its allies are the laws of average and the breaks of the game. It is turned down by hundreds, yet never gets discouraged.

Then one fine morning it reaches a buyer whose cheap castings are holding up his production line. . . . Last week he was not interested. This morning he reads every word ". . . castings that will go through your high speed equipment without holding up the show. . . ." He telephones you: "Can you prove that?" You can—and you do. That's about the way foundry advertising functions.

Publishes Accident Rates In Machine Field

National Safety council, 20 North Wacker drive, Chicago, has published a report on frequency and accident severity rates in the machinery industry. The data for the report was assembled from 241 plants whose employes worked 405,991,000 manhours. The report states that frequency changes in the foundry industry from 1934 to 1935 were 0.0 per cent but from 1926 to 1935 were down 61 per cent. Severity changes in the foundry field from 1934 to 1935 declined 53 per cent and from 1926 to 1935, 81 per cent.

ADVERTISING PAGES REMOVED

Founding of Pressure Castings

(*Continued from page* 31)

fracture. Fig. 1 shows a cylinder, weighing 2300 pounds that was tested to destruction, failing at 6000 pounds per square inch pressure.

Fig. 2 shows the structure of this iron at 100 diameters, etched. Fig. 3 is the same specimen at 500 diameters. Tensile strength, taken from test specimens cut from the walls of actual castings, runs from 40,000 up to 48,000 pounds per square inch. The brinell hardness varies from 207 to 217. A standard 1¼-inch diameter test bar is gray throughout and castings as thin as 1 inch in wall section are quite readily machinable.

If there is any white iron in the fracture of the 1¼-inch bar it is a definite indication that the iron is off. Two heats were made, accidentally, with silicon at 1.23 per cent and 1.28 per cent. The iron was lifeless, freezing on the lip of the ladle, and showed a white network in the fracture of the arbitration bar. We then found that more than a charge of 15 per cent silicon pig had remained in the drop, which accounted for the low silicon.

A return to the charging scheme that would insure bringing all of this silicon down into the ladle eliminated the trouble. Thus we feel that 1.40 per cent silicon is the lower limit for an iron running 2.50 to 2.70 per cent total carbon. Silicon, in the cupola charge, is a splendid deoxidizer, and exerts a softening effect through preventing excessive oxidation.

Shows White Fracture

In an attempt to force carbon still lower than 2.50 per cent, a heat was run with bed and coke splits lower than standard, but with regular blast volume and charges. Carbon dropped to 2.34 per cent and silicon to 1.39 per cent, with manganese at 0.77 per cent. The heat was a total loss and melting conditions were such that iron actually was burned in the cupola. The charging door resembled a huge fire-works sparkler.

The iron was lifeless, shrunk badly and showed a dead white fracture in a 2-inch diameter pouring sprue. Strangely enough, this sprue was machined readily with high speed steel; a tensile piece cut and threaded from it failed at 46,440 pounds per square inch. We feel that with our method the low limit of carbon is 2.40 per cent, as we have had successful heats with the total carbon just under 2.50 per cent.

Considerable relief from rejections, because of leaks, internal draws and shrinkage on high pressure parts and also from low bursting pressures has been had from the use of the two-cupola iron. This is true to such an extent that the process and thoughts connected with it have influenced our practice with the high test irons melted in one cupola. Attempts were made to produce a similar iron in one cupola, the 54-inch, but with varying degrees of success. The same materials were used, but a charge

Fig. 5—Cylinder iron poured dull, 50 diameters, unetched

of soft iron equivalent to that which would ordinarily be added in the molten condition was added to the steel-mix charges. These additions were made in several different ways but results were never up to standard.

Heavy walled high pressure castings were likely to sweat at test pressures at 1000 pounds per square inch and up, at points where fins or flash had been chipped off, indicating a coarser structure. Graphite was coarser as shown by micrographs.

The basic thoughts as we see them in the two-cupola process are as follows: 1. Materials charged into the 54-inch cupola are almost entirely free of carbon in the graphitic form. Carbon content of the charges is low. These conditions, coupled with others, make for a finely divided graphite. 2. The iron has a low carbon content, which is conducive to high strength, early freezing and a uniformly fine-grained structure. 3. Best results always have been obtained when this iron has been melted hot and poured as hot as possible. The hotter a cupola-melted iron is poured the quicker and more uniformly it cools through the freezing range.

This molten hard iron partakes of the virtues of a superheated iron. However, it is too hard for any of our castings, and has a high shrinkage, with little or no graphitization. This hard iron properly melted, has plenty of molten life, as sandblast nozzles and sandslinger tips are cast from it with no trouble from misruns. The soft iron added provides the softening elements necessary, that is, the graphite nuclei and some silicon.

Difference in Graphite Structure

Incidentally, to retain the benefits of a superheated iron, soft iron is added to the hard iron as late as possible in the process so that the graphite structure will not be coarse. We think this is so, because of an experience we had four years ago. Since this high test iron is poured quite hot it punishes the dry sand molds and cores severely. The iron was held, in order to cool it down, for 20 minutes before pouring, on two successive days.

Cylinders from both heats burst at ordinary testing pressures. Tensile specimens were cut from the walls of the cylinders and were tested. There was a decrease of from 12,000 to 15,000 pounds per square inch in strength, as they broke at 32,000 to 35,000 pounds per square inch. Chemical analyses were quite what they should be. However, a microscopic examination at 50 diameters showed a vast difference in the graphite structure.

Graphite in the dull poured iron was very coarse, which to our mind accounted for the drop in strength. Fig. 4 shows the graphite, at 50 diameters of a satisfactory iron. The sample was taken from the 2-inch wall of a cylinder, poured as hot as possible.

Fig. 5 shows the graphite, at 50 diameters in a sample taken from the same location as Fig. 4, only from a cylinder poured on the dull side. The iron had been melted hot but was cooled down in the ladle. Then an examination of the fracture with a low powered magnifying glass, 3 or 4 diameters, showed small rounded dark gray patches in a normal silvery gray matrix.

Hence, we add the soft iron to the hard iron not more than 5 minutes before pouring is begun. The mixture then is poured promptly with as little reduction in temperature as possible. An optical pyrometer reading indicates an apparent temperature of about 2550 degrees

Fahrenheit, or actual temperature around 2700 to 2750 degrees Fahrenheit at the spout of the hard iron cupola.

We believe from actual experience that low total carbon, from 2.40 to 3.00 per cent, is desirable in unalloyed iron, for high pressure work. It promotes a fine-grained structure both as to matrix and graphite, so necessary for pressure-tightness and strength, if poured between 2600 and 2700 degrees Fahrenheit actual temperatures. This we admit is about as hot as we can melt in a cupola.

It makes for uniformity of structure in varying wall sections, as judged from examination of the fractures of several hundred heavy walled cylinders. Its freezing range is such that, with proper risering, shrinkage and spongy spots are readily avoided. When sections do not exceed 2 inches in thickness risers can be eliminated.

Risers Must Be Large

If risers are used, they must be large enough to feed the casting without pumping or churning with a rod. Churning feeding heads in low carbon iron mixtures in our experience is actually harmful. The juncture of the riser with the casting always showed large open shrink holes. Incidentally, we learned several years ago that the use of chills or denseners, as well as chaplets and anchors on low carbon iron castings is bad.

Even though the denseners used on internal cores in a large cylinder were quite light as compared to the wall section against which they were used, a fine hair line chill was formed on the inside. This reduced the bursting pressure of the cylinders tremendously. An improvement in melting conditions removed need for risers, and use of chills. Chaplets and core anchors are apt to produce blowholes in castings.

Evidently the metal begins to freeze at such a high temperature and to develop the mushy state so soon in the cooling cycle that gas formed, when the iron strikes the cold chaplets, is not released by the metal. It is our practice to bolt all cores down or hang them in the cope. It is only on non-pressure sections of castings and un-machined parts where anchors and chaplets are used.

Any fluttering of the iron against mold or core is bad for low carbon cast irons. Gas formed usually is trapped in the casting. So all core sand and molding sand mixtures must be open and free-venting. Several so-called shrinkage problems were solved by use of a vent wire.

The second basic thought in connection with the two-cupola process deals with low total carbon content. Lowering of total carbon is brought about in the cupola by use of steel rails in the charges which are melted under the following conditions:

A low bed is used so that molten iron has less coke through which to pass and absorb carbon. Incidentally, there may be a slight tendency towards an oxidizing condition with a low bed, which makes for a reduction in carbon in any mixture. By-product coke used is a very dense grade. The analysis of which is: Volatile matter, 0.90 per cent; fixed carbon, 91.5 per cent; ash, 7.7 per cent, and sulphur 0.58 per cent.

It is slow burning and holds up well. Coke charges are low compared to other papers written on the subject of melting a high steel charge in the cupola. Blast used is normal. Evidently, this dense slow burning coke, coupled with the blast used, maintains the bed at a low point, without dropping it too low. In our pig iron-scrap iron mixtures we have noticed a definite drop in the total carbon content. For years it ran close to 3.50 per cent, when using a bee-hive coke. Since we have used a by-product coke the carbon has gradually dropped, to between 3.25 and 3.30 per cent.

We tried three different brands of by-product coke, each succeeding brand denser (heavier per unit volume) than the preceding. Each change brought with it a lowering of total carbon. The present coke is the densest and gives the lowest carbon, possibly because we can and do use less of it per charge, by weight, than any of the others. So the grade of coke as well as the bed height affects the total carbon.

Tuyeres are set close to the sand bottom; 6 to 7 inches above it. Thus the amount of coke below the tuyeres is held to a minimum, and the iron has still less coke through which to pass. Because the tuyeres are set so close to the bottom the tap must run continuously. As fast as the iron melts it is withdrawn from the cupola and also from the carbonizing influences of coke in the well of the cupola. The iron spout is of the skimming type, for the removal of slag.

The third basic thought is that pertaining to pouring temperature. Incidentally, what follows covers pouring practice used on our entire line of pressure castings. All low carbon high test iron castings are poured as hot as possible. No time is lost between tapping out and pouring the molds. It is our belief that the hotter cupola-melted metal is poured, the finer and more uniform the grain structure and the greater the freedom from internal defects and chilled corners.

Most investigational work on the effect of superheating cast iron on its physical properties has been done in the electric furnace. Temperatures reached in the experiments are much higher than those obtained in a cupola. We pour at about 2650 degrees Fahrenheit actual temperature.

This is close to the best pouring temperatures for superheated electric furnace irons, for an electric furnace iron superheated to 2800 and 2900 degrees Fahrenheit will give its best physicals at a pouring temperature between 2600 and 2700 degrees Fahrenheit. So starting off with a cupola melted iron in which the carbon is quite all dissolved and at a temperature around 2700 degrees Fahrenheit some of the benefits of an electric furnace refined iron are had.

Hot Iron Is Essential

There was a period, several years ago in our shop, during which all castings, large and small, for heavy pressures and light pressures, cast in green sand and dry sand, were poured on the dull side. If the metal was hot it was chilled down by adding scrap to the ladle. Then with no other changes, as far as iron mixture, sand, molding, gating, etc. are concerned, there followed a period during which all molds, both green and dry sand, were poured as hot as the iron could be got to them. The machine shop losses from leakers, dirt, shrink and spongy spots, dropped so suddenly that it served as conclusive proof that hot pouring is essential to pressure tight castings. The improvement in the machine shop was so marked that hot pouring is required.

(To Be Concluded)

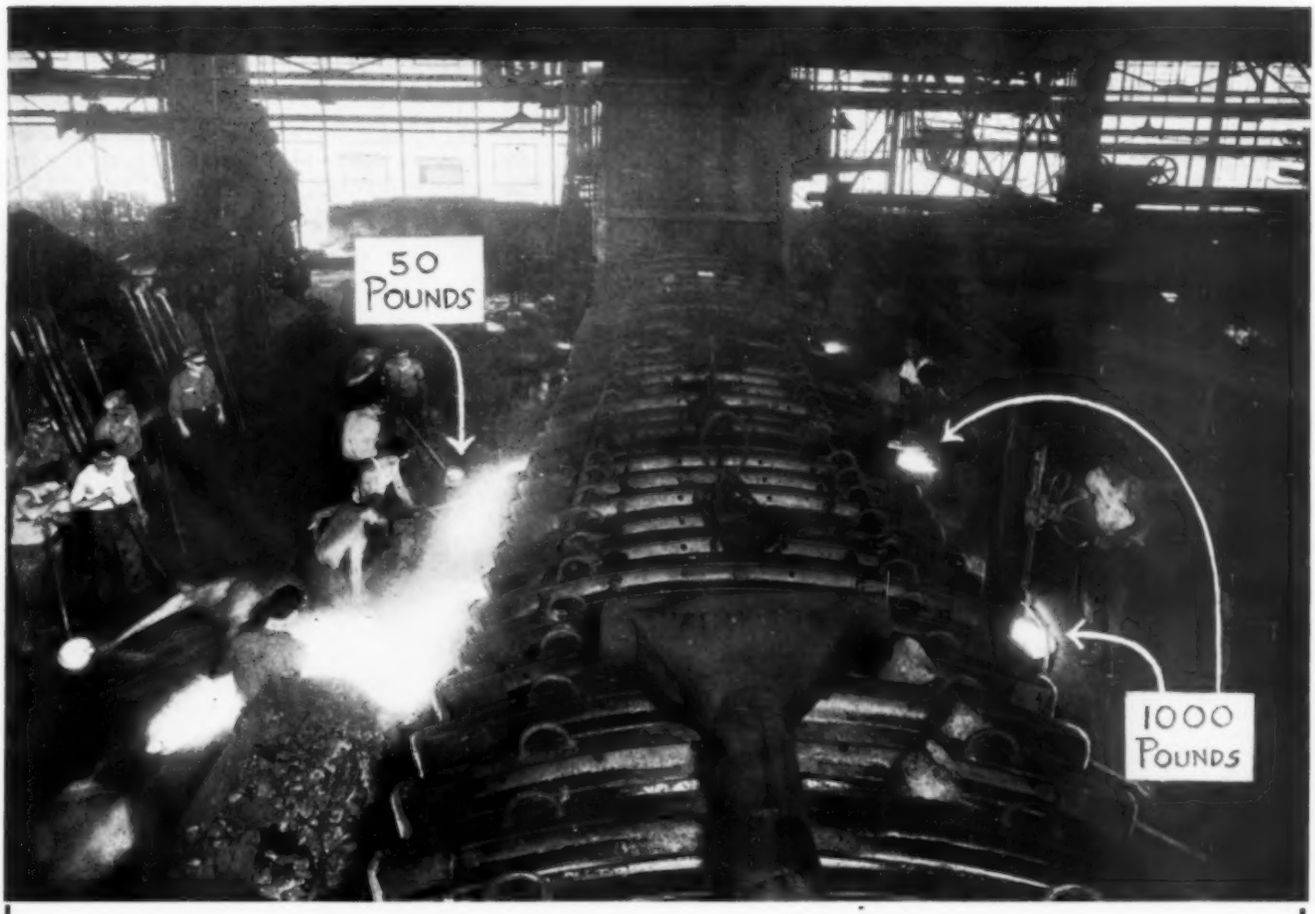
Company Changes Name

Chain Products Co., Cleveland, has changed its name to Hodell Chain Co., to associate more closely the corporate title with its products brand. This does not involve any product, personnel or policy changes.

General Offices Moved

General Refractories Co., Philadelphia, has moved its general offices to the Real Estate Trust building at Broad and Chestnut streets, Philadelphia.

Industrial Supplies Inc., Memphis, Tenn., has been appointed distributor for the Link-Belt Co., Chicago, handling elevating, conveying and power transmitting chains and machinery.



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are you equipped to handle your molten metal efficiently?

The above view shows distinctly how great a saving can be made by eliminating the back-breaking job of carrying the metal by hand. On the right, the metal is tapped off into two *Modern Pouring Devices* with 1000 pound ladles with which one man transports and pours as much metal as 20 hand pourers.

On the left is a crew of hand pourers in the section not yet Modern equipped. Despite the large number of pourers on this side, they take off only a small proportion of the heat.

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The use of *Modern Covered and Insulated Ladles in Modern Pouring Devices* has enabled handling much larger quantities of metal at a time and pouring much lighter work than here-to-fore. Production is increased, being no longer limited by pouring capacity; labor turnover is reduced.

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MODERN EQUIPMENT CO.

Why More Captive Foundries?

(*Continued from page 25*)

stitute ever did was the publication of its standard sales agreement and the approval of that agreement by the Purchasing Agent's association. More contacts of that kind between buyer and seller would be most beneficial.

Price Cutting May Bring Unit Management

I HAVE read your interesting editorial regarding foundries, and in reply to the questions therein would advise as follows.

For convenience I have numbered the questions and answers in the order in which they appear in the editorial. It seems to me that questions 1 and 2 are alike and the reply is to the effect that manufacturers put in their own foundries because they cannot buy the type of service which they require from the jobbing foundries at an economically sound price.

Question 3. As a matter of basic economics, there is no more reason why a manufacturer should show hesitancy in going into the foundry business and setting up a foundry department to meet his own needs than exists in respect to say his pipe fitting shop or his welding shop, or in fact any other one department in his business.

Question 4 has been so designed as to suggest an answer, and my opinion is that it is not a matter of capability but rather a matter of securing reliability in respect to delivery and price from a department which is essentially a basic factor in any business making its major portions or components from cast iron or steel.

Question 5. The possibilities are not gilded but the experience of most buyers of castings has been a sad one in respect to delivery prices, service, refunds on defective castings and continuity of supply. In other words, the outside foundry will usually give the most service to those customers who pay the highest prices in an emergency.

Question 6 is but another variety of questions 4 and 5, and 7 is further repetition. 8 invites the comment that the business practices of the average jobbing foundry operator leave much to be desired from the point of view of the man who makes his living by building machines from castings.

Question 9. The answer to this question is yes, plus poor business service.

Question 10. The answer to this is by inference yes. 11. No. The answer to 12 is the setting up of a code of ethics and a standard price list similar to those used by the steel foundries. 13. Obsolete methods and equipment.

Question 14. There is no special ray of light from Heaven shining down on any business. If obsolete methods and equipment make prices high, the owners must take the consequence, i.e., they must go out of business, or else change their ways.

15. Yes, unless the recommendations in 14 are carried out.

16. The profit lusts of castings buyers is no lustier than that of other buyers.

17. There is a very definite place in the economic setup of American industry for the jobbing foundry, but the owners of Jobbing Foundries must realize that there are two sides to every business. There is a technical and practical side usually combined in foundry operations and there is also a business side. The foundries have failed on the business side. Their methods are obsolete, they have no uniform code of ethics, their prices are all screwy, and they have no loyalty to each other. In other words, they are the worst bunch of price cutters that it is about possible to find in American business, not even excluding the corner clothing stores in some of the big industrial cities.

You may well ask what there is to be done about it, one way would be to emulate some of the ideas of the chain store, setting up foundries in those districts where the jobbing business is sufficient to pay dividends when the business in that locality is run economically.

The profits from such small jobbing businesses are insufficient to attract in properly trained business men to handle the accounts and sales policies. Hence, the chain is the only answer.

Can you not see the rugged individuals running the small foundries squirming at having to give up their little kingdom, the ground from under which they have been carving out with their price cutting knives for the last 25 years.

Pretty plain talk, but it's about time somebody put it into words.

Sound Costs Would Prove Purchase Economy

IT HAS always seemed to me ever since I knew anything of the jobbing foundry industry, that the owners of captive foundries have done their level best to fool themselves in many instances, if not in all, by allocating their overhead so that the cost of their foundry product would be such as to force a competing jobbing foundry to sell below cost. I admit this is not always the case. I know of one instance where the overhead was applied to the foundry just as it is to all of the departments of the entire manufacturing plant, but I have known the question to be debated many, many times and manufacturers producing, for instance, machine tools, automobiles, airplane engines, or what have you, have contended that the entire overhead of their plant should be applied to the finished product and not distributed to the different departments.

This brings the question, therefore, to a debate on the subject of cost accounting and I think we all admit that it is a difficult thing to have two cost accountants agree for they all seem to have their own pet ideas and are not willing to admit that the other fellow's ideas are as sound as their own. A reasonable compromise between the two is hard to obtain. I have always contended that the manufacturer who operates a machine shop, pattern shop, carpenter shop, foundry, etc., should distribute his overhead to each of the individual shops and determine the cost of the products in each; and if he did so, it would frequently be found that the jobbing foundry was able to serve him more economically and the final cost of his products would be proportionately reduced.

There is a definite value in support of jobbing foundries that owners of captive foundries are overlooking. It frequently happens that only one line of business is somewhat dormant and other lines are active enabling the jobbing foundry to have a reasonably normal production and consequently maintain a reasonably normal price; whereas the captive foundry's costs must go up and down with the change in that industry. If it happens that the industry is busy and quantity production enables low costs, fine. If, however, that line is not so busy, the reduction in output of the foundry raises the cost.

Auto Driver Kicks On Street Car Service

SOME owners of foundries feel that they can use the jobbing foundry to take care of their needs when their costs are high by closing their own foundry at that time, which always reminds me of the motorist, who, when his car breaks down, is peeved because the streetcar line does not operate more frequently to give him prompt service. The street car line, however, is operating under average conditions, much of which is brought about by reduced demand for service due to the use of automobiles for transportation.

There are jobbing foundries that are so highly specialists that their services cannot be compared with the services of the usual captive foun-

(*Continued on page 75*)

ADVERTISING PAGES REMOVED

(*Continued from page* 72)

dry. Such jobbing foundries are like the specialists in the medical profession as compared with the general practitioner. These highly specialized foundries are equipped with men and equipment trained and organized to produce a specialty of exceptionally high quality to meet the particular needs; and it would be surprising to find any captive foundry that was organized to do similar work, since all captive foundries are designed to produce at a cost, in the first place; the quality of the goods being secondary, although maintained at a high standard in many instances.

Is Parent Lenient On Own Castings Quality

A FEATURE that has done much to make captive foundries appear economical to their owners is one that I have resented many times when visiting plants. I refer to the acceptance of all castings produced, by the machine shop, in the hope that they are all machined satisfactorily and only rejecting them after they have done their utmost to make them acceptable. This contrasts with the attitude toward castings that are bought from the outside, which is to reject the castings that do not look just perfect when they arrive and the moment a microscopic defect is discovered in the process of manufacture they are rejected; and consequently castings produced by the captive foundry show a much higher percentage of acceptance and the jobbing foundry must include in their cost figure, the cost of these rejections and, therefore, their cost figure may be higher in some cases than they would had the same attitude of inspection been applied in both cases.

I have particularly noted this in the case of some gray iron castings and malleable castings that have been called to my attention. In the case of our own experience, I think we have been exceptionally fortunate, but I attribute this to the fact that we are specialists rather than general practitioners.

Cites Low Earnings In Jobbing Steel Trade

REFERRING to your question in THE FOUNDRY for July, "Why More Captive Foundries?", I believe the reason for so many so-called "captive" steel foundries, is lack of actual knowledge on the part of those users of castings who start their own steel foundry departments.

They do not know that on the average they can buy castings from the jobbing foundries cheaper than they can produce them themselves.

They do not know that over a period of 15 years the jobbing steel foundries, as a whole, have made an average profit on invested capital of less than 4 per cent.

They do not know that the capital required, if invested in the highest grade securities, would give them a better return.

Many of them learn the facts when it is too late, and although regretting having started such a department, the investment having been made they continue to operate, and finding that their own requirements do not offer sufficient tonnage, they go outside in direct competition with the jobbing foundries, making it still harder for the latter to make a living.

The statistics of the industry are readily available, but they are either not ascertained or are disregarded.

Asks Tolerance From Castings Buyers

MAY I congratulate you on your editorial page of the July issue of THE FOUNDRY, copy of which was sent me. You ask some very pertinent questions in the first article that I think the captive foundries may have a hard time answering. A little more consideration for the other fellow, and the other fellow's business might solve this problem that makes it so difficult for the jobbing foundry. A little more progressiveness, and a little better business sense on the part of the foundryman would help. Then add a little better co-operation all around, and there might not be so many captive foundries.

The second editorial under the caption "What is it" is excellent, and I trust will help clarify the uncertainty that exists over price-fixing. It should be quoted widely.

Advocates Contact Between Maker and User

WHY more captive foundries" is extremely timely and I, myself, should like to know the real answer. My theory is that it is the result of a vicious circle which tends toward eventual monopolies and mergers or else government control or fascism.

The cycle as I see it was as follows:

Shortage of foundry facilities brought captive foundries and a surplus of jobbing foundries. Insured delivery caused the captive foundry and lure of gain the excess jobbing foundries.

Competition ran wild and price buying became the order of the day. To lower price, costs had to be cut. There were two ways to do this, provided equipment and management were equal. One was wages and the other quality.

Quality suffered. The manufacturer's engineer began to decry cast iron because, whether made in a captive or jobbing foundry, the manufacturer looked at costs and wanted to know why his foundry could not meet jobbing prices and the foundry superintendent, with his own job and reputation at stake, was human.

This situation had its part in bringing about the marvelous development in substitute materials. Plastics, welding, fabricated steel, stampings, etc., advanced by leaps and bounds. And here is where the manufacturer often made his mistake. He jumped to substitutes which produced his desired results more or less, but ofttimes at a greater cost and decreased efficiency of performance than are obtainable from *quality* gray iron.

The Gray Iron Founders' society, having diagnosed this situation, is now making every effort to correct it. This is the age of specifications and the gray iron foundry is equipped to meet them. The customer cannot expect surface, strength, hardness, or other qualities unless prepared to meet their cost. Customers, consult your engineer and foundryman and you will save money in the end!

Castings Inventory Ties Up Working Capital

THE only comment I can truthfully make on the editorial in the July issue of THE FOUNDRY is that it has always been a mystery to me why corporations which are users of castings operate their own foundries, much less build new ones. There doubtless exist a number of captive foundries which are operated so efficiently that castings can be produced for less than they could be purchased from an outside foundry. On the other hand I am equally convinced that a number of corporations operating their own foundries are losing money by doing so, although this fact may be covered up in their cost accounting system by failure to set up proper overhead costs.

Most casting users have a seasonal requirement so that their foundry is subject to long periods of low production. The outside jobbing foundry avoids the violence of seasonal fluctuation because of diversification of customers and, therefore, can operate more efficiently.

If the captive foundry attempts to spread its work by building inventories during the slack period it does so at a considerable sacrifice of working capital in seasonal inventory. This capital might better be utilized in the development of markets or in the installation of equipment to reduce costs of other manufacturing operations.

The captive foundries are doubtless with us to stay, but with the large capacity available in jobbing foundries and low prices it would seem to be unwise to open a captive foundry department.

(*To Be Concluded in September*)

Obituary

JOHN GILMORE PLATT, president and general manager, Hunt-Spiller Mfg. Corp., South Boston, Mass., was drowned at East Harwich on July 26. Mr. Platt was born in Zanesville, O., in 1874 and was educated in the public schools. He entered the railway service with the Baltimore & Ohio railroad and was successively messenger, apprentice in the locomotive department, locomotive draftsman, and chief draftsman at Newark, O. In 1902 he became associated with the Erie railroad as master mechanic at Jersey City, and subsequently was made engineer of tests at Meadville, Pa.

John Gilmore Platt

In 1907 he became associated with the American Steel Foundries as master mechanic at the Franklin branch. He became associated with the Hunt-Spiller Mfg. Corp. in 1907 as mechanical representative and then advanced successively to the positions of sales manager, vice president and general manager.

Mr. Platt was active in a number of railway organizations including the Railway Supply Manufacturers association, the Railway Business association, the New England Railroad club, the Canadian Railway club, the Central Railway club, the New York Railroad club, Railway Club of Pittsburgh, Southern & Southwestern Railway club and the Western Railway club.

♦ ♦ ♦

Rowland J. Millar, 67, vice president and general manager, Pease Foundry Co. Ltd., Toronto, Ont., died in Toronto July 12.

♦ ♦ ♦

Charles Rohlfs, 83, originator of mission furniture and husband of the late Anna Katharine Green, who established the formula for modern mystery-detective stories in 1878 with her novel "The Leavenworth Case," died June 29 in Buffalo. At the age of 14 he found work in a machine shop and by 1872 he was designing stoves and furnaces.

For several years, Mr. Rohlfs followed a stage career, appearing for a time with the company of the late Edwin Booth. Soon after his marriage he moved to Buffalo to become manager of a foundry. His furniture designs met with instant popular approval, some of his pieces being placed in European museums.

♦ ♦ ♦

David R. Marshall, 67, former superintendent of Framingham Foundries Inc., Framingham, Mass., died in that city July 18.

♦ ♦ ♦

John C. Whitridge, 64, president and general manager of Buckeye Steel Castings Co., Columbus, O., died July 30.

♦ ♦ ♦

Walter A. Stone, 73, president and treasurer, Clinton Foundry Co., Lancaster, Mass., died July 6 at his home in Lancaster. The Clinton foundry is said to be one of the oldest in the state and has been in the Stone family for generations.

♦ ♦ ♦

L. Heeley Link, 49, vice president and secretary, Bass Foundry & Machine Co., Fort Wayne, Ind., died in Fort Wayne July 12. He was identified with the Bass company for 33 years, and was president of the Indiana Manufacturers' association.

♦ ♦ ♦

Clarence L. Jones, 53, chief accountant and office manager, Florence Pipe Foundry & Machine Co., Florence, N. J., died June 10 in Florence. He was a member of the National Association of Cost Accountants and had been employed by the company for the past 28 years.

♦ ♦ ♦

William Butterworth, 71, chairman of the board, Deere & Co., Moline, Ill., and former president of the United States Chamber of Commerce, died May 31 at Absecon, N. J. Mr. Butterworth joined Deere & Co. in 1892 as an assistant buyer. He was elected president in 1907, retaining this position until 1928 when he became chairman. He was president of the Illinois Manufacturers' association from 1917 to 1920.

♦ ♦ ♦

Cyrus McCormick, 77, retired chairman of the board, International Harvester Co., Chicago, died June 2 at his home in Lake Forest, Ill. A son of the inventor of the reaping machine, Mr. McCormick joined the McCormick Harvesting Machine Co. in 1879, retiring from active business in 1935. When the McCormick company was reorganized in 1902 into the International Harvester Co., Mr. McCormick was elected president, later serving as chairman.

♦ ♦ ♦

William J. Wark, 63, general manager and superintendent of the Buffalo branch of E. J. Woodison Co., Detroit, died July 7 at his summer home in Canada. Born and raised in Hamilton, Ont., Mr. Wark was naturalized in 1896 in Toledo, O. During his life he had been connected with the Canada Iron Corp. Ltd., Montreal, New York Car Wheel Co., Buffalo, Howard Iron Works, Buffalo, and Whitehead Bros. Co., New York. He owned and operated the Century Iron & Steel Co., Buffalo. Mr. Wark organized and was secretary of the Buffalo Foundrymen's association.

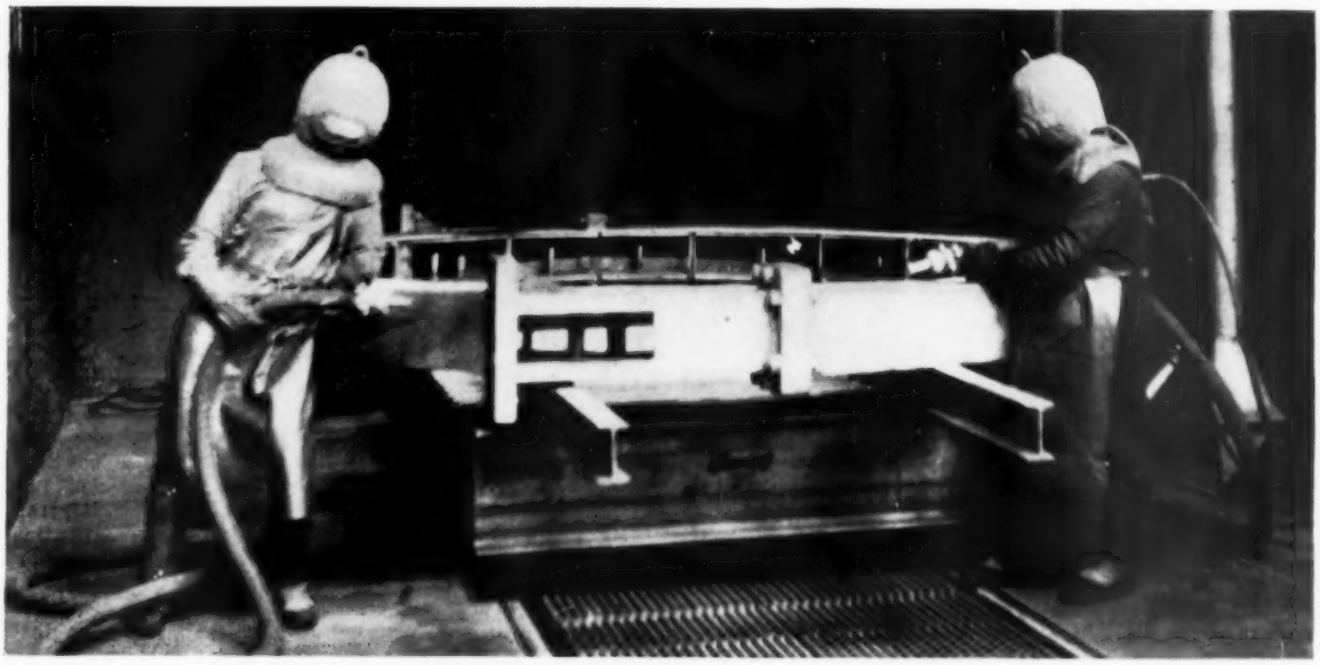
William J. Wark

Nominates Officers

Alfred Hutchinson, vice-president, director of the Skinningrove Iron Co., Ltd., has been nominated president of the British Iron and Steel institute, to take office in May, 1937, on the retirement of the present president, Sir Harold Carpenter. The Right Hon. the Earl of Dudley, member of council, chairman of the Earl of Dudley's Round Oak Works, Ltd., has been nominated president to take office in May, 1938.

The autumn meeting of the institute will be held in Dusseldorf, Germany, from Sept. 21 to 26, by invitation of the Verein deutscher Eisenhuttenleute acting on behalf of the German iron and steel industry.

Gerald B. Duff, 39 Oxford street, Newark, N. J., has been appointed sales representative in metropolitan New York, by the Campbell-Hausfeld Co., Harrison, O., manufacturers of gas and oil fired melting furnaces.



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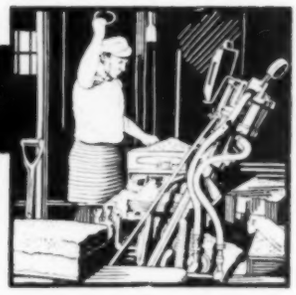
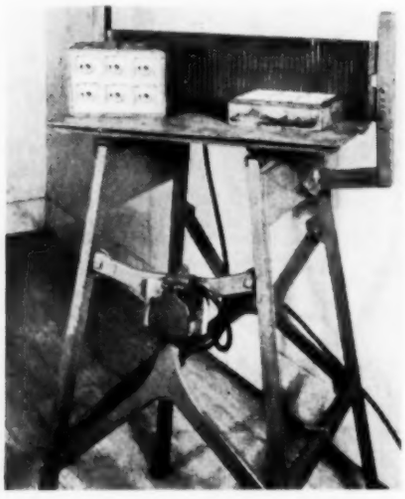
NEW EQUIPMENT . . . . for foundries



Machine Designed To Give Straight Draw

Great Lakes Foundry Sand Co., Detroit, has developed a cast iron bench core drawing machine shown in the accompanying illustration. Principal feature of the machine is a vibrating plate which releases the core from the box. This plate has perpendicular grooves or slots and the plate can be raised or lowered, according to the depths of core drawn.



The plate has perpendicular grooves or slots to guide the draw

The core box, which has lugs on the side, is placed against the vibrating plate, the lugs fitting into the grooves on the plate. When the plate is vibrated, it is said to give a straight draw for the box. Ends of the vibrating plate are rubber insulated as is the frame on which the core plate rests. The unit is made in 10, 18 and 26-inch sizes.

Electric Elevator

Barrett-Cravens Co., Chicago, has developed a new electric elevator for both portable and permanent installations to be used in the piling of material ceiling high, handling jigs and dies, and for sidewalk and floor-to-floor work. Made in capacities ranging from 500 to 5000 pounds, the elevator employs direct motor drive, cut spur gears—fully enclosed and running in oil—electric solenoid brake integral with the motor and three point suspension of hoist to give floating power. Other features include cable control and top and bottom limit stops.

Small Generator May Be Mounted on Truck

Linde Air Products Co., 30 East 42nd street, New York recently has developed a small size medium pressure acetylene generator for portable or stationary service. This latest addition to the line has a 50 pound carbide capacity with a double rating of 100 cubic feet of acetylene per hour. Developed for use with any type of oxyacetylene cutting or welding apparatus the generator may be mounted on a truck or fitted for permanent installation to supply medium pressure acetylene through pipe lines.

Develops Two New Products For Grinding

E. F. Houghton & Co., 240 West Somerset street, Philadelphia, recently has placed two new products for precision and mirror finish grinding on the market.

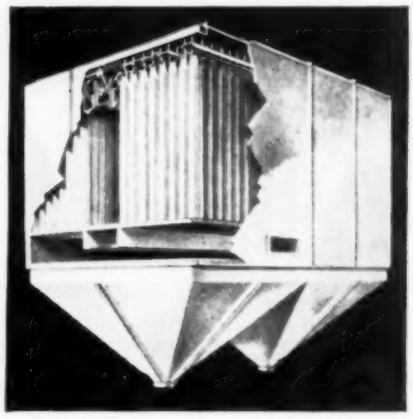
Advantages which the manufacturer claims for these items include the prevention of rust, freedom from gumming or sludging, uniformity and stability, sterility and the ability to wet-out rapidly and penetrate to the point where work is being done. Chips are washed away quickly and will settle out immediately. These products are readily soluble in water.

Plastic Insulation

Botfield Refractories Co., Swanson and Clymer streets, Philadelphia, recently has developed a plastic insulating cement. This product can be applied by hand, trowel, or cement spraying equipment, and is claimed to give efficient insulation up to 2000 degrees Fahr. It is stated that the cement will adhere firmly to any clean surface and has no shrinkage.

Dust Collector Has Independent Cloth Tubes

American Foundry Equipment Co., 555 Byrkit street, Mishawaka, Ind., has announced a dust collector that is simple in design and operation. The heart of the unit, shown in the accompanying illustration, is a long tube made of special woven fabric suited for filtering of ordinary dust. Spring suspension of the dust tubes is designed to maintain proper tension on the cloth. In this multiple tube design, each one works independently. If a tube is damaged, it can be easily unhooked, rolled up and placed in the inlet seal at the bottom, thus sealing the opening temporarily without interfering with operation.



Spring suspension is designed to maintain proper cloth tension

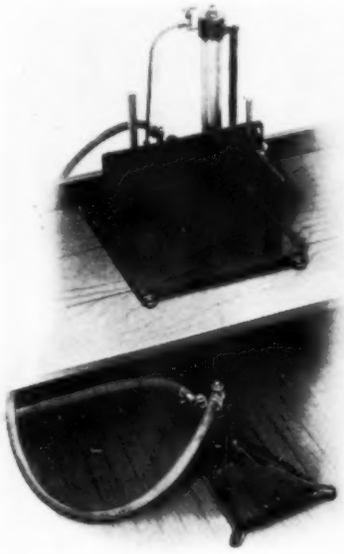
Electrode Holder

Jackson Electrode Holder Co., Detroit, embodies improved principles of design in its new model. To eliminate flashes caused by contacting the electrode holder with grounded parts, insulation has been provided in this unit, air circulation being placed between insulation and metal to achieve coolness. It is provided with replaceable copper alloy jaws which it is claimed combine the properties of structural steel with those of pure copper.

ADVERTISING PAGES REMOVED

Core Stripper Operates in Short Time

Myron C. Kline, 1152 West Twenty-eighth street, Erie, Pa., has introduced a quick drawing core stripper shown in the accompanying illustration. The core is rammed and rolled over on the core plate in the usual way. Box and plate then are placed on the machine and held with the hands against the angular stripping



A slight pressure of the foot on operating pedal starts vibrator

frame. A slight pressure of the foot on the operating pedal admits air and starts the vibrator. In another second or less the stripping frame starts upward, moving the box away from the plate.

When the foot is moved away from the pedal, operation of the machine stops and the stripping frame drops to its starting position which may be regulated by a stop pin provided for that purpose. The machine is said to strip any box within its capacity providing the sides of the boxes are made at a 90 degree angle to the face. Boxes may be round, square, oval or any other shape. Specifications for the unit include a weight of 75 pounds, 7 feet of supply hose, a ½-inch vibrator and a stripping height of 6 inches.

Current Contactor

General Electric Co., Schenectady, N. Y., is introducing a new low voltage alternating current contactor which will remain closed through voltage disturbances or failure. The mechanism is closed by a direct-current magnet energized through a copper oxide rectifier and is held closed by the attraction of a permanently magnetized core and the movable armature.

A reversal of the coil exciting current by a pushbutton or other pilot control device, causes the contactor to open by momentarily "bucking down" the flux of the permanent magnet.

Lubrication Gun Has 40 Pound Capacity

Alemite, division of Stewart-Warner Corp., Chicago, is introducing electric and air-operated twin lubrication guns. The new design is compact and has a capacity of 40 pounds. Both guns are portable and easily handle all types of the heaviest and most fibrous lubricants. Simple construction permits quick access to all moving parts. The air-operated type delivers 11 to 18 ounces of lubricant per minute at 150 to 200 pounds air pressure, while the electric model powered with a universal motor for alternating or direct current, develops approximately 5000 pounds of pressure delivering nine ounces of lubricant per minute.

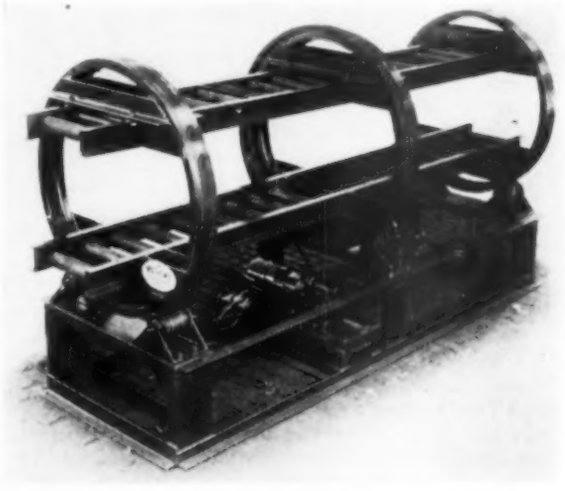
Reflectors for Mercury Vapor Lamps

Miller Co., Meriden, Conn., has developed a reflector for mercury vapor lighting, which permits the use of ordinary incandescent lamps along with the mercury vapor lamp in a single fixture. The equipment includes styles and types of reflectors for any type of mounting for practically all industrial locations and for color correction of mercury vapor illumination by individual or combined equipment.

Roll-Over Device Handles Heavy Objects

Mathews Conveyor Co., Ellwood City, Pa., has developed a motor driven roll over device incorporating ball bearing roller conveyors. A device of that type is used in manufacturing processes for changing the position of heavy objects. In the automotive industry, cylinder block castings are rotated in that manner, eliminating lifting.

The unit shown in the accompanying illustration, is 10 feet long and is designed to handle loads up to 1800 pounds. The rollover operates on ball bearings and the loads are conveyed in like manner. Travel is controlled by electrical limit switches.



Rollover operates on ball bearings, handling loads up to 1800 pounds

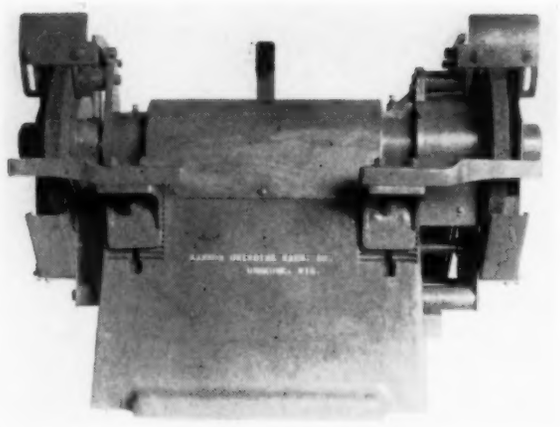
New Disk Grinder Provides Enclosed Parts

Sturdy construction and extreme accuracy are features claimed for the disk grinder shown in the accompanying illustration and made in two sizes 18 and 24-inch by the Kindt-Collins Co., 12697 Elmwood Ave., Cleveland. Other features include balanced operation, quick, accurate adjustment, automatic light, enclosed

The table is supported by an arm on each side

parts and dust proof ball bearings which only require annual lubrication. The table is supported rigidly on both sides by arms sliding in machined ways. It may be tilted down to an angle of 45 degrees and up to 25 degrees. An automatic locking device snaps in position at the 45 and 90 degree angles. The degree scale is engraved on the arm.

Dust is drawn from the face by a 6-inch ball bearing fan operating at 3500 revolutions per minute. A switch on the face of the frame under table controls a ball bearing motor of the repulsion and induction type. The



New drive ropes can be installed without disturbing the arbor

disk is driven by a multiple V-belt assuring smooth performance, maximum power and long life. The disk 18 inches diameter, ½-inch thick is balanced dynamically and accurate to within 0.003-inch. The motor may be 110-220 volt, alternating or direct current, ¾, 1 or 1½ horsepower in rubber mountings. Standard speed is 1850 revolutions per minute, but the machine may be designed for any speed between 1100 and 2200 revolutions per minute. Both sides of the back guard are cut away to permit sanding 1-shaped pieces at any angle.

Motor Has External Fan on Commutator End

Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., has introduced a fan cooled totally enclosed direct current motor which has external fan and shroud on the commutator end, with the same accessibility to armature as on straight totally enclosed motors.

Removal of but one cover from a bracket opening permits accessibility to the brushes. Construction permits the use of an external blower on the commutator end, without the disadvantage of having to remove two covers to examine the commutator. Since the blower is on the commutator end and not on the pinion end, it permits mounting the motor snugly against a gear case or other wall.

Grinding Machine Has Four Speed Changes

A new grinding machine, built for operation of 24-inch and 30-inch high speed wheels for foundry grinding, has been introduced recently by the Ransom Grinding Machine Co., Oshkosh, Wis. Four changes of speed are accomplished by changing the sheaves on the motor. Speed is controlled and so arranged that it is apparent from the front of the machine when the next larger size sheave should be put on to speed up the wheels. Drive from the motor to the spindle is by tex-ropes which run from sheaves of unusual diameter on the spindle. This sheave is placed outside the right hand end bearing and is arranged so that new drive ropes can be installed without disturbing the arbor. A 15-horsepower motor is bolted rigidly to the back of the machine which is equipped for operating wheels with a 12-inch hole. The 24-inch machine weighs 3850 pounds and the 30-inch, 3900 pounds.

Band Saw Has Large Cast Iron Table

Oliver Machinery Co., Grand Rapids, Mich., has designed recently an 18-inch metal cutting band saw for circle, irregular curve and straight cutting of sheet steel, metals, rods, all kinds of tubing, sprues of soft metal, hard rubber, compositions, etc. It is a self-contained, portable machine, regularly fitted with motor-on-shaft and a large cast iron table with miter cut-off gage and parallel cutting fence.

The unit takes 18 inches between saw and column, can use saws to ½-inch in width, will cut parallel to 11 inches wide and will cut off and miter to 6½ inches. The motor is enclosed, 1 horsepower, operates on either alternating or direct current, 110 or 220 volts and turns 1800 revolutions per minute. Extreme dimensions of the actual space occupied are 23 x 33 inches. Each machine is equipped with one saw blade ⅜-inch wide, one parallel cutting gage, one angle cut gage and one filling strip.

Hydraulic Bucket

Hayward Co., 50 Church street, New York, has introduced its electro-hydraulic bucket recently. Said to be an improved type of clam shell bucket, it is operated by a motor-driven fluid pump controlling a hydraulic ram and can be hooked to a crane, electric hoist, or ordinary derrick. Opening and closing are accomplished by the electric motor, controlled from the operator's cab. The bucket is recommended for power and industrial plants in digging and rehandling coal, ore, coke, slag and other materials.

Core Machine Has Movable Vibrating Plate

Core boxes are said to be stripped accurately and swiftly with the new core machine recently introduced by Harry W. Dietert Co., Detroit. The unit has a table 16 x 24 inches and a vibrating plate 8 x 16 inches which may be raised 4 inches above the top of the table to clear thick core

Vibration does not reach table on which cores are stripped

plates. It is supplied with electric or air vibrator together with knee switch and has a net weight of 90 pounds.

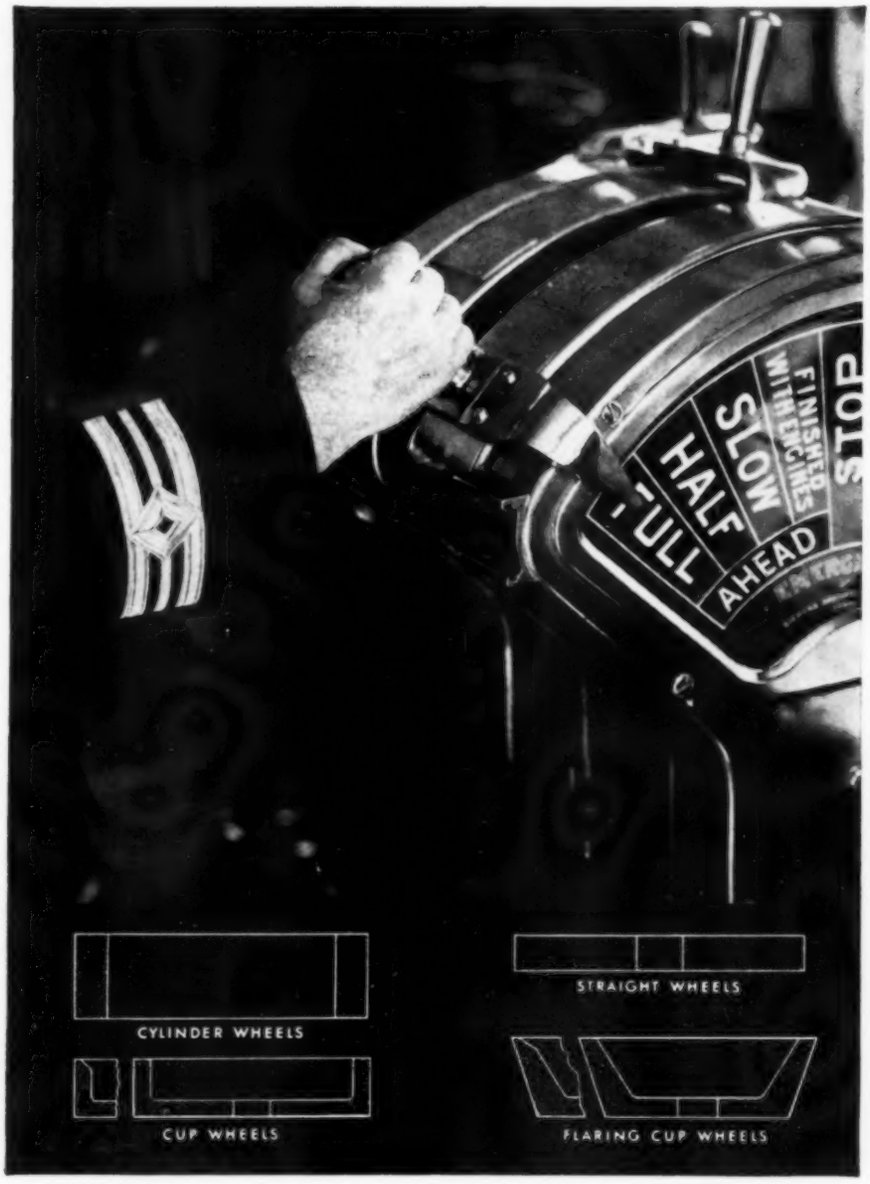
The core maker consists of three major parts, a cast iron base on which is mounted a cast iron table and a vertical plate which is vibrated. Because of a special connection the vibration does not reach the table on which the cores are stripped. As seen in the accompanying illustration, a movable vertical guide is mounted on the vertical plate. The core box is pushed against the vertical plate and guide, the vibrator is started by pressing the knee switch and the vertical plate imparts vibration to the core box.

Forms Company To Market Silica Sand

White Rock Silica Co. of Wisconsin, recently organized, has started production at its property at Browntown, Wis. This company is engaged in the production of silica sand for the foundry and ceramic industries. White Rock Silica Co., with headquarters in Tribune tower, Chicago, has been formed as exclusive national distributor of the producing company's output. Harry Haze is president of the company and John Grant vice president.

Full Speed Ahead

...CUTS GRINDING COSTS



IN grinding work, as in any other production process, it is needless waste to spend three hours on a job that readily can be performed in two. Yet that is just what happens when grinding wheels are operated at speeds below the maximum practical rate.

Through use of modern abrasive wheels bonded with Bakelite Resinoid, the advantages of high speed are made available for nearly all types of grinding. For industrial snagging, Bakelite Bonded wheels permit safe, continuous operation at speeds up to 9,500 s. f. p. m.; for cut-off, up to 16,000 s. f. p. m.

Important characteristics of Bakelite Bonded wheels that now make practical these new accelerated speeds are: great tensile strength to resist chipping and breakage; open, porous structure that insures cool operation; high uniformity of grade and structure; and heat resistance that prevents softening or gumming of the bond.

On some classes of grinding work, Bakelite Bonded wheels are cutting unit costs one-third to one-half. Consult any leading abrasive wheel manufacturer about benefits of full-speed grinding with Bakelite Bonded wheels. Also write for our informative booklet, 15G, "High Speed Abrasive Wheels."

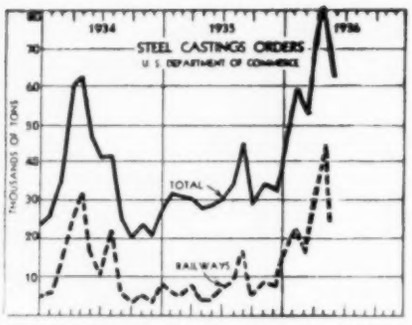
BAKELITE CORPORATION, 247 PARK AVENUE, NEW YORK, N.Y.
BAKELITE CORPORATION OF CANADA, LIMITED, 163 Dufferin Street, Toronto, Ontario, Canada

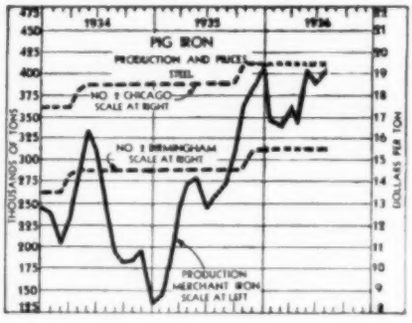
BAKELITE

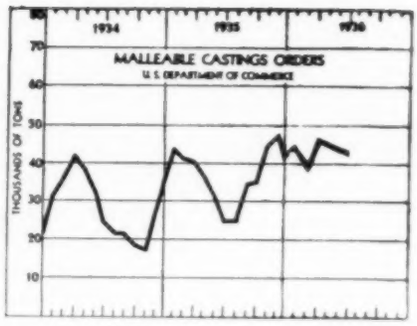
"The registered trade marks shown above distinguish materials manufactured by Bakelite Corporation. Under the symbol "B" in the numerical sign for infinity or unlimited quantity, it symbolizes the infinite number of present and future uses of Bakelite Corporation's products"

BONDED WHEELS

FOR ECONOMICAL HIGH SPEED GRINDING







Foundry Activities

Reflect Industrial Trends

FOUNDRY operations in the Chicago district declined slightly during July. The letdown was less than usual for the month, however, and the average melt continued relatively heavy for mid-summer. Reduced activity was most apparent among automotive and farm implement plants, both of which were affected by the season. In addition, the heat wave made it necessary to close some plants for a short time, while schedules of practically all foundries were restricted by the high temperature. Casting demand for freight car and other railroad equipment building was at the best rate in 6 years, while activity among producers of heating and sanitary ware fixtures continued fairly high. Steel foundry operations showed a marked increase compared with the restricted rate of the past several years.

* * *

Gardner Denver Co., Quincy, Ill., proposes to construct a $150,000 one-story foundry.

* * *

Atlantic Foundry, 182 Beaver street, Akron, O., expects to spend $7500 for additions to its plant.

* * *

Great Lakes Foundry Co., Port Huron, Mich., now unoccupied, was damaged by fire July 7.

* * *

National Bearing Metals Corp., 626 Armstrong street, St. Paul, is spending $40,000 for the erection of an addition to its foundry.

* * *

General Malleable Corp., Waukesha, Wis., is remodeling and making several additions to its plant on East Main street.

* * *

An order was filed in circuit court July 20, in Coldwater, Mich., discontinuing the petition filed a month ago by the Homer Furnace & Foundry Corp., Coldwater, which sought the dissolution of the company. The plant has resumed operations.

* * *

Operation of the A-B Stove Co. foundry, Battle Creek, Mich., which has been idle for some time, has been resumed giving employment to approximately 100 men. It will be operated by the Kalamazoo Stove Co. and will supply both that concern and the A-B Stove Co. which has been purchasing its castings at Marshall and Coldwater, Mich.

* * *

Northwestern Stove Repair Co., 721 West Bunker street, Chicago, is making plans for the building of a one-story foundry at a cost of $50,000.

* * *

Waterbury Farrel Foundry & Machine Co., Waterbury, Conn., has acquired property on Benedict street, adjoining its foundry, which may be used for a new building.

* * *

Crawfordsville Foundry Co., Crawfordsville, Ind., has been reorganized with a capital stock of 700 shares of preferred and 350 shares of common, no par value.

* * *

Great Lakes Foundry & Machine Corp., Toledo, O., has been organized with a capital of $20,000. E. H. Forster, G. N. Dederich and Stanley J. Hiett, 402 Home Bank building, Toledo, are the principals.

* * *

Jakes Foundry Co., 2800 Charlotte avenue, West Nashville, Tenn., is planning to rebuild a portion of its plant recently damaged by fire. Edward Jakes is president.

* * *

Kelsey-Hayes Wheel Co., 3600 Military road, Detroit, has asked bids through Giffels & Vallet Inc., architects, 606 Marquette building, Detroit, for alterations to its foundry.

* * *

Hannon Foundry & Pattern Co., 1721 West Maypole avenue, Chicago, has been incorporated by John P., Margaret and Edward Hannon. Correspondent is Sonnenschein, Berkson, Lautmann, Levinson and Morse, 77

(*Concluded on page 87*)

RAW MATERIAL PRICES
Aug. 5, 1936

Iron	
No. 2 foundry, Valley	$19.50
No. 2 Southern, Birmingham	15.50
No. 2 foundry, Chicago	19.50
No. 2 foundry, Buffalo	19.50
Basic, Buffalo	18.50
Basic, Valley	19.00
Malleable, Chicago	19.50
Malleable, Buffalo	20.00
Charcoal iron, furnace	22.00
Coke	
Connellsville beehive premium	$5.50
Wise county beehive coke	$ 4.30 to 5.00
Detroit by-product coke	9.00
Scrap	
Heavy melting steel, Valley	$14.00 to $14.50
Heavy melting steel, Pitts.(dlv.)	15.25 to 15.75
Heavy melting steel, Chicago	14.00 to 14.50
Stove plate, Buffalo	10.00 to 10.25
Stove plate, Chicago	7.50 to 8.00
No. 1 cast, New York	10.00 to 10.50
No. 1 cast, mchy., Chicago	13.00 to 13.50
No. 1 cast, Pittsburgh	14.50 to 15.00
No. 1 cast, Philadelphia	14.50 to 15.00
No. 1 cast, Birmingham	10.50 to 11.50
Car wheels, iron, Pittsburgh	14.00 to 14.50
Car wheels, iron, Chicago	14.00 to 14.50
Railroad malleable, Chicago	16.00 to 16.50
Malleable, Buffalo	15.50 to 16.00
Nonferrous Metals	**Cents per pound**
Castings copper, refinery	9.40
Straits tin	42.62½
Aluminum, 99 per cent	19.00 to 21.00
Aluminum, No. 12 (Secondary, standard)	16.25 to 16.75
Lead, New York	4.60
Antimony, New York	13.00
Nickel, electro	35.00
Zinc, East St. Louis, Ill.	4.80

ADVERTISING PAGES REMOVED

(*Concluded from page* 84)

West Washington street, Chicago.

* * *

The Burlenbach Foundry Co., Quakertown, Pa., has been organized and has rented the foundry of the Quakertown Stove Works which has been out of operation for several years. John E. Burlenbach is president and treasurer of the new company, E. C. Shoemaker, Atlantic City, N. J., is vice president and H. E. Burlenbach, Milburn, N. J., is secretary.

* * *

Activity in the gray iron and steel foundries located in the Philadelphia Federal Reserve district increased during June, according to reports received by the industrial research department of the University of Pennsylvania. For the steel foundries this represents the third consecutive month in which production was maintained at the highest level since the second quarter of 1930. Gray iron foundries produced more castings in June than in any month since October 1930. During June inventories of raw materials on hand in the steel foundries changed substantially, especially in pig iron which increased and in coke which decreased, while the amount of scrap in stock declined slightly. Shipments of steel castings fell off about nine per cent, but both steel and gray iron foundries reported a large increase in the volume of unfilled orders.

* * *

Index of foundry equipment orders, according to a report of the Foundry Equipment Manufacturer's association, Cleveland, was 141.4 in June 1936, as compared with 165.1 in May 1936 and 100.1 in June 1935. Index of shipments was 153.0 in June 1936, 146.7 in May 1936 and 82.2 in June 1935.

NEW *Trade Publications*

FOUNDRY EQUIPMENT — C. O. Bartlett & Snow Co., Cleveland, has issued an interesting and comprehensive booklet on its line of equipment for mechanized foundry practice. Photographs of some typical installations, four suggested layouts and diagrams and illustrations of the company's shakeouts, screens, sand conditioning and distribution equipment, hoppers, gates, castings handling and accessory equipment are provided.

LIFT TRUCKS — Barrett-Carvens Co., Chicago, emphasizes in a late booklet the advantages, improvements and specifications of its new light-duty lift truck.

LABORATORY GLASSWARE—Kimble Glass Co., Vineland, N. J., has made available a catalog containing listings, illustrations and descriptions of its entire line of glassware for industrial and technical laboratories.

GAS REMOVAL—Foundry Services Inc., 107 East Forty-first street, New York, has published a bulletin on its aluminum degaser which is employed to remove soluble gases from aluminum and thus eliminate pinholes. Directions for use are given.

MAGNESIUM CASTINGS — High Duty Alloys Ltd. and Magnesium Castings & Products Ltd., Slough, Bucks, England, have prepared a booklet which includes several articles on "Light Alloy Practice" by H. G. Warrington.

LENSES—Willson Products Inc., Reading, Pa., recently has published a bulletin describing the features of its flat safety goggle lenses which possess high strength to resist impact. The bulletin points out that while lenses of glass can be broken, clearness and freedom from distortion add greatly to the ability of the lenses to withstand impact stresses.

MATERIAL HANDLING — Lewis-Shepard Co., Boston, describes its line of portable elevators and stackers in a recent bulletin. These are manufactured in both hand and power-operated types.

AFTERCOOLERS — Ingersoll-Rand Co., Phillipsburg, N. J., has released a bulletin featuring an aftercooler designed to serve air and gas compressors of moderate capacities. Essential features, benefits and sizes of this unit are presented.

FACTORY BUILDING—Austin Co., Cleveland, has made a comparison of the relative values and disadvantages of multistory and single story buildings for factories, through its engineering department. This is published in its new booklet on plant design.

SUBSIDIARIES — American Brake Shoe & Foundry Co., New York, has published recently a listing of products manufactured by its subsidiaries and associated companies, with photographs, features of design and uses included.

FURNACES—Campbell-Hausfeld Co., Harrison, O., has issued a booklet on its line of stationary, lever tilting, gear tilting and other types of furnaces made interchangeable for either gas or oil fuel. Illustrations and typical installations are given.

STEEL FABRICATION — Peter A. Frasse & Co. Inc., New York, has published a 42-page booklet on the fabrication and treatment of stainless and heat resisting steels. A summary is given of the latest information concerning this subject. The booklet is designed not only for general use but also as a practical help to the engineer and shop foreman.

CLEANING BARRELS — Pangborn Corp., Hagerstown, Md., describing its new rotoblast cleaning barrel in its latest folder, cites advantages and lists the featured characteristics of the unit.

MOTORS—Ohio Electric Mfg. Co., has presented a few of the more important operations pertaining to the construction of its line of fractional horsepower motors, in a recent booklet.

SEAMLESS TUBING—Parker Appliance Co., Cleveland, has prepared information concerning its various types of tubing for industrial installation. Strength, selection, terms of sale and list prices are some of the topics touched upon.

BLOWERS—Roots-Connersville Blower Corp., Connersville, Ind., has distributed literature on its positive displacement blowers for foundry cupolas. Principles of construction and operation are outlined. Advantages, types of drive and specifications, air pressure, heights and control also are features.

HEATERS—L. J. Wing Mfg. Co., 154 West Fourteenth street, New York, has issued a bulletin on its heaters for the warming of air as it enters garages, freight houses, shipping and receiving departments, factories and warehouses. Capacity, installation and design data is included.

AIR DRYERS—Pittsburgh Lectrodryer Corp., Pittsburgh, describes its machine for dehumidification in a recent pamphlet. Moisture is removed by the physical phenomenon of adsorption in this machine. Included are typical installations, a listing of uses and general description.

ELECTRO-MAGNETIC EQUIPMENT — Electromagnets Ltd., 2 Church street, Colmore row, Birmingham, England, has published information and illustration on its line of electro lifting magnets, magnetic separators, clutches, brakes and accessories for various purposes.

COMPRESSORS—Sullivan Machinery Co., Chicago, recently published a bulletin concerning its line of 25 to 75-horsepower compressors, built to specifications set by the user. Kinds and types of drives available, features of performance and forms of control are discussed.

MEEHANITE SPECIFICATIONS—Meehanite Metal Corp., Pittsburgh, has compiled a metal specification chart with respect to recommended grades of meehanite for various service requirements. General engineering, wear resisting, heat resisting and corrosion resisting castings are covered.

SAND EQUIPMENT—National Engineering Co., Chicago, has issued a folder on its mixer unit for sand reclamation, conditioning and control, designed and developed for small and medium-size foundries. Operation, features of design and a user's report are included.

LIGHT DUTY TRUCKS—Policyholders service bureau, Metropolitan Life Insurance Co., New York, has published one of its business pamphlets on "Operating Costs of Light Duty Trucks." Starting with a discussion of the general factors affecting trucking cost, it classifies uniform expense, gives the

scope of the survey and summarizes the cost situation by truck sizes. Classifications also are made according to length of route, age of vehicle, states, regions and cities, and types of business. The pamphlet concludes with interesting comment and statistics on trends in operating costs from 1932 to 1934.

ABRASIVES—Norton Co., Worcester, Mass., has published a compact booklet on grinding and finishing with portable equipment. Emphasis is given by showing uses of abrasives in steel mills, foundries, railroads and car shops, etc.

LIGHTING—General Electric Co., Schenectady, N. Y., has distributed literature pertaining to the lowering of costs in lighting and the improvement of the actual light effect. Illustrations are given of its line of mercury, silvered bowl and lumiline lamps.

REFRACTORY CONCRETE — Quigley Co., New York, has sent out a bulletin on its light weight insulating refractory concrete for furnace linings, doors, shapes, covers, heat shields, etc. Advantages and applications are discussed.

HARDWOODS—Lignum-Vitae Products Corp., Jersey City, N. J., has published one of a series of articles in folder form on its line of lignum-vitae woods for use in practical applications. How some organizations use this product as told in their own words, is an unusual feature.

CHARTS—International Nickel Co., New York, has sent out circulars enclosing charts on the approximate relations between brinell, Rockwell and shore hardness values and corresponding tensile strengths, a guide to the selection of nickel alloy steels and a guide to the selection of nickel cast irons.

CHANNEL VALVES—Ingersoll-Rand Co., Phillipsburg, N. J., has furnished material on its line channel valves of importance to air and gas compressor users. Construction assembly of the valve is shown by an unusual method and details of design and essential features are related.

MOLDING MACHINES—International Molding Machine Co., Chicago, has made available two catalogs containing information on its line of jolt squeezers and plain squeezers and including illustrations, sizes, etc. The publications also describe its line of core blowers, with photographs and advantages listed.

BULK MATERIAL CONTROL—Bin-Dicator Co., Detroit, has presented information pertinent to its line of bin level indicators for automatic indication and control of bulk material levels in bins in a recent bulletin. Cost, signal and alarm devices and development are three subjects covered in the material.

HIGH CHROMIUM STEELS—Linde Air Products Co., New York, has made available information on the welding and cutting of high chromium steels. Emphasis is placed on the recent discovery of the improved welding characteristics resulting from the addition of columbium to both base metal and welding rod.

THERMOMETERS — Bristol Co., Waterbury, Conn., has issued a publication on thermometers, containing 88 pages of useful information concerning the theory and practice of modern thermometry. Covering liquid-filled, vapor-tension, gas-filled recording, indicating and controlling thermometers, the booklet also describes a new small-bulb gas-filled thermometer. Over 500 temperature recording charts are illustrated in full size.

Faked Foundry Facts

Black Hart

MOLDING MACHINES—Osborn Mfg. Co., Cleveland, has sent out a catalog on its jolt rockover pattern draw molding machines operated entirely by power. Features of design, operation and construction of these machines are a part of the booklet.

SILICA FIRESTONE — Cleveland Quarries Co., Cleveland, describes its quarry facilities at Amherst, O., in a recent bulletin, and interesting details concerning the splitting and cutting of stone, its various uses and instructions concerning its application are given.

PUMPS — Worthington Pump & Machinery Corp., Harrison, N. J., has prepared three folders on self-priming pumping units, centrifugal pumps for underpass drainage, and balanced multi-stage volute centrifuga. pumps, as manufactured by the company, giving illustration and informative data. Also a bulletin on vertical four-cycle diesel engines has been issued by the company, and one on its condensate return units.

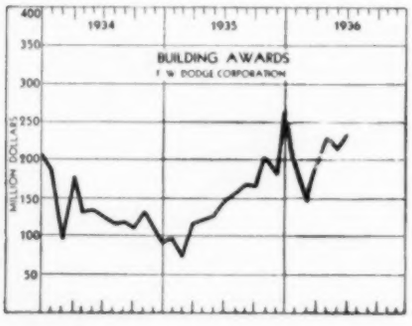
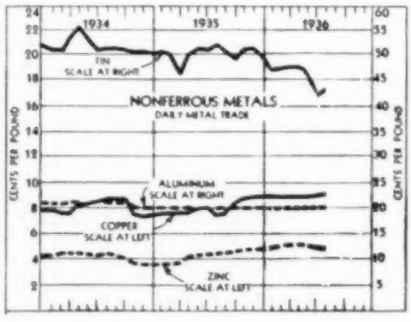
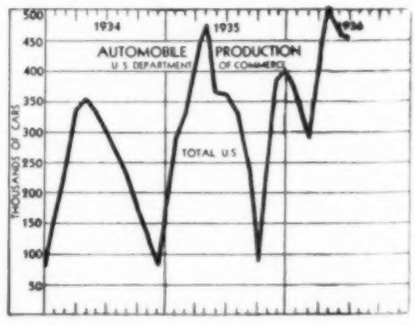
CHAINS—Columbus McKinnon Chain Corp., Tonawanda, N. Y., has published useful information on welded and weldless chain. Definitions, cautions and instructions covering the purchase and use of chain is a feature, followed by a comprehensive listing and description of the company's line.

AIR FILTERS—Staynew Filter Corp., Rochester, N. Y., has published a folder on its line of automatic air filters for ventilating purposes. Principles of design, operating mechanism, control and air line features, and engineering data are presented in detail and the principle of dry filtration is described.

EQUIPMENT—Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., has issued a souvenir booklet, in commemoration of its fiftieth anniversary. The booklet is illustrated with photographs of early installations, contrasted with modern ones. Equipment for every use from home to largest industrial requirements is depicted.

SPECTOGRAPHY—Bausch & Lomb Optical Co., Rochester N. Y., gives pertinent information on its line of instruments for spectographic analysis in a recent publication. Selection of instruments is considered, a quantitative analysis is made and the company's various types of instruments are discussed.

CONVEYORS — Eastern Corp., New York, emphasizes its line of roller conveyors in a late release. Enclosed is an engineering data sheet, giving general specifications, selection and methods of ordering the unit. The roller with tubular axle and locking pins is also presented.

TEMPERATURE CONTROL—Brown Instrument Co., Philadelphia, describes the modernization of its line of temperature instruments in a folder. Greater accuracy is the point of emphasis. Control of costly temperature fluctuations is another feature. The company also has issued another well-organized booklet on temperature instruments from the executive's viewpoint.

OVENS—Despatch Oven Co., Minneapolis, in its recent bulletin on air tempering furnaces heated by gas, describes its rotary fan for driving heated air downward with pressure and velocity in and around the parts to be processed. Also, advantages, heat treating results, operating economies, loading methods and specifications are given.